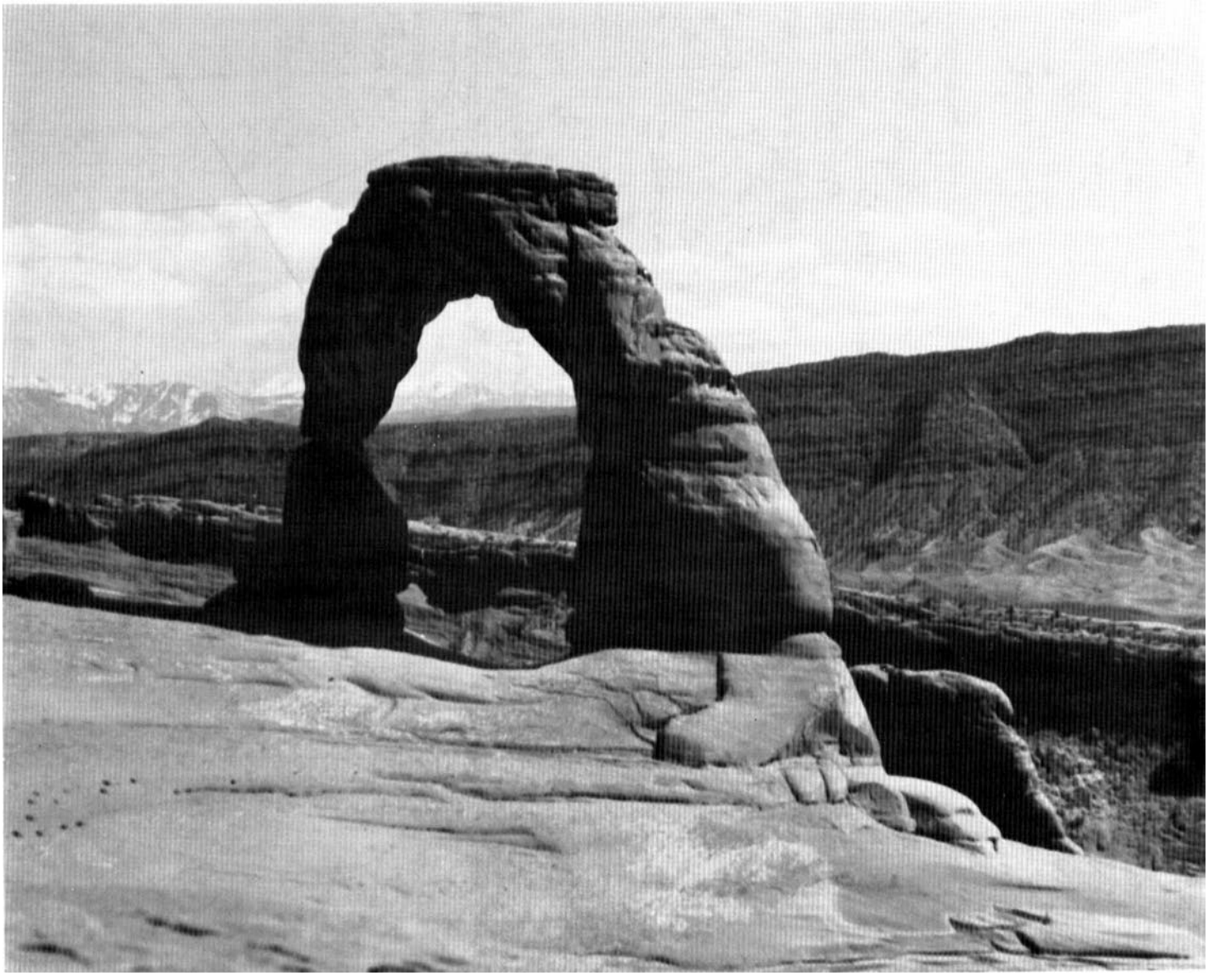
United States Department of Agriculture

Soil Conservation Service

In cooperation with United States Department of the Interior, Bureau of Land Management, and Utah Agricultural Experiment Station

Soil Survey of Grand County, Utah

Central Part



How To Use This Soil Survey

General Soil Map

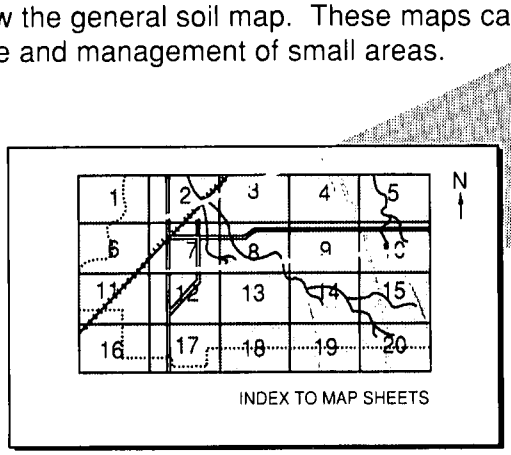
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

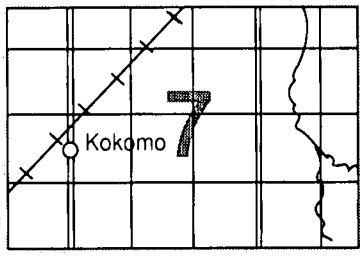
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

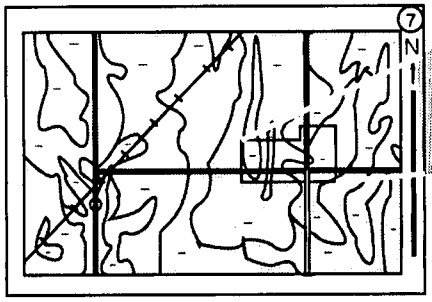


INDEX TO MAP SHEETS



MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



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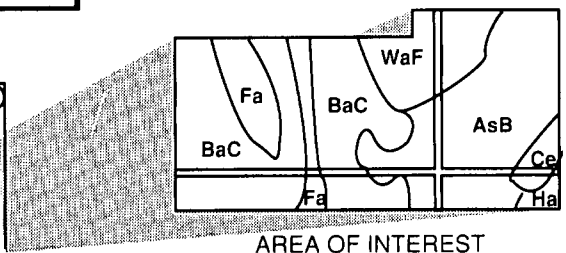

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1980-81. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service, the Bureau of Land Management, and the Utah Agricultural Experiment Station. It is part of the technical assistance furnished to the Grand and Green River Soil Conservation Districts.

Cover: Delicate Arch in Arches National Park. The landscape in the background is typical for the area with broad structural benches bounded by steep canyons and valley floors.

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Issued September 1989

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Summary of Tables

Foreword

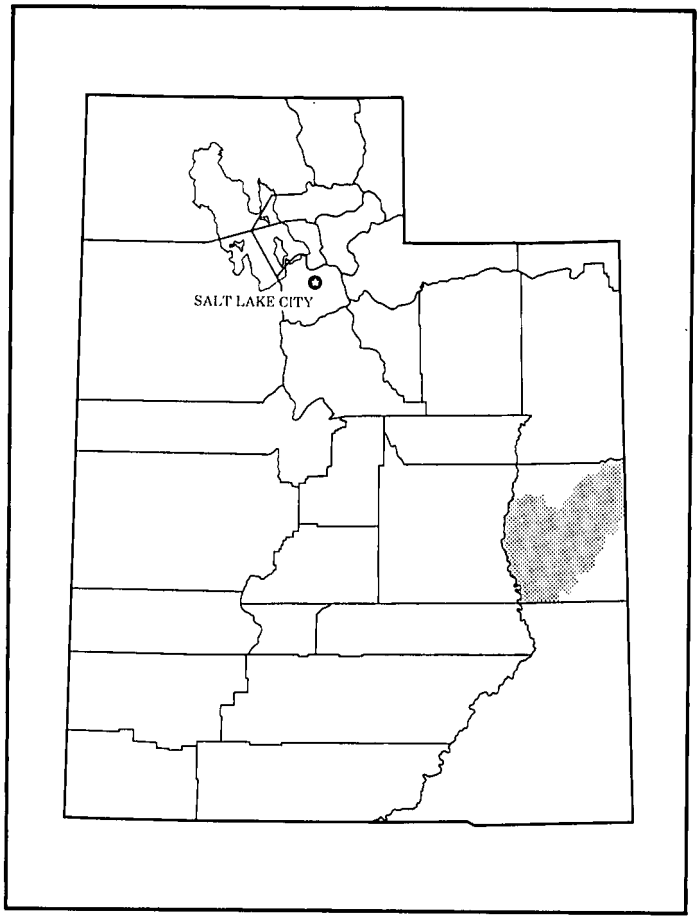
This soil survey contains information that can be used in land-planning programs in Grand County, Utah, Central Part. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Francis T. Holt
State Conservationist
Soil Conservation Service



Location of Grand County, Central Part, in Utah.

Soil Survey of Grand County, Utah Central Part

By David T. Hansen, Bureau of Land Management

Fieldwork by Bill Mikus, Wayne M. Svejnoha, and David T. Hansen, Bureau of Land Management; and Duane A. Lammers, Stephen Howell, Carolyn Nader, and Darrell T. Hall, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
United States Department of the Interior, Bureau of Land Management, and the Utah Agricultural Experiment Station

GRAND COUNTY, UTAH, CENTRAL PART, is in southeastern Utah. The western boundary of the survey area is Emery County, along the Green River; the southern boundary is the San Juan County line and the Colorado River; the eastern boundary is the Colorado State line; and the northern boundary is the Uintah and Ouray Indian Reservation on the western side and the rim of the Roan Cliffs on the eastern side. The survey area has a total area of 1,596,709 acres, or about 2,495 square miles.

Moab, the county seat of Grand County, is just south of the survey area. The population in the vicinity of Moab is about 8,000. The population in the survey area is about 100. The people are concentrated in the towns of Elgin, Crescent Junction, Thompson, and Cisco and on isolated ranches.

Most of the survey area is public land. It includes Arches National Park and part of Dead Horse Point State Park. Most of the rest of the land area is administered by the Bureau of Land Management. Some state administered land is south of Crescent Junction, west of Arches National Park, and near the town of Cisco and in small areas scattered throughout the survey area. Most privately owned land is in the towns or along the Green and Colorado Rivers and some perennial streams where water is available for irrigation.

The extraction and processing of uranium ore, oil, gas, and potash are major industries in the area. Livestock grazing and producing alfalfa hay and melons, in areas where water is available for irrigation, are the principal agricultural uses of the area. Recreation is also of vital importance to the area. Many people visit the area each year to explore Arches National Park, Dead Horse Point State Park, or nearby Canyonlands National Park. Besides hiking trails, jeep trails, and motorcycle trails, numerous float trips are available on the Green and Colorado Rivers.

The survey area is crossed by Interstate 70 and the Denver and Rio Grande Railroad.

The Green and Colorado Rivers drain the survey area. The terrain is complex; it ranges from nearly level plains, mesas, and structural benches to very steep canyons and mountains. Elevation ranges from about 4,000 feet at the Green and Colorado Rivers to about 9,100 feet at the crest of the Roan Cliffs.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In this survey area the summers are hot, especially at lower elevations, and the winters are cold. Precipitation normally is light at lower elevations during all months of the year. At higher elevations, precipitation is much greater and snow accumulates to considerable depths. Much of the snowmelt is used to irrigate crops in nearby valleys.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Thompson, Utah, for the period 1951-80. Table 2 shows probable dates of the last freeze in spring and the first freeze in fall. Table 3 provides data on length of the growing season.

In winter, the average temperature is 30 degrees F and the average daily minimum temperature is 19 degrees. The lowest temperature on record, which occurred at Thompson on January 13, 1963, is -23 degrees. In summer, the average temperature is 76 degrees and the average daily maximum temperature is 90 degrees. The highest recorded temperature, which occurred on June 23, 1954, is 102 degrees.

Growing degree days, shown in table 1, are equivalent to heat units. During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 4 inches, or 50 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 3 inches. The heaviest 1-day rainfall on record, 2 inches, occurred at Thompson on August 29, 1951. Thunderstorms occur on about 30 days each year, and most occur in summer.

Average seasonal snowfall is 12 inches. The greatest snow depth at any one time during the period of record was 19 inches. On the average, 7 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

Average relative humidity in midafternoon is about 40 percent. Humidity is higher at night, and the average at dawn is about 60 percent. The percentage of possible sunshine is 75 percent in summer and 60 percent in winter. The prevailing wind is from the east-southeast. Average windspeed is highest, 10 miles per hour, in summer.

Every few years a blizzard strikes the survey area with high winds and drifting snow. Even at lower elevations, snow remains on the ground for many weeks and livestock suffer.

How This Survey Was Made

Soil scientists, with the assistance of range specialists, made this survey as a study of soil and plant community relationships. They identified the soils in an area, how they occur, what plant communities are associated with these soils, and the major uses of the soils. Before actual fieldwork was begun, available information on soils, geology, climate, vegetation, landforms, and patterns of land use was gathered, This information was interpreted on the basis of a national system for classifying soils and from knowledge of soil-plant relationships in similar areas of the state. The information was generalized and placed on a map at a scale of 1:250,000, This was used by the mapping team to determine where major breaks between kinds of soil and plant communities could be expected to occur. These maps were adjusted to reflect the soils and plant communities encountered in more detailed mapping.

Precipitation breaks are based on statewide convention. They are an estimate of effective precipitation for a plant community or a range site. They represent the breaks between Desert, Semidesert, Upland, Mountain, and High Mountain plant groups. The soil moisture regimes by convention also correspond to these precipitation breaks. Soils in the aridic moisture regime are usually dry in all parts during the growing season and are never moist for as long as 90 days in any part when plants are actively growing. Soils in the Ustic moisture regime are usually dry but are moist more than half the time during the growing season. Soil temperature represents critical breaks for length of time in most years that biological activity can be expected to occur in the soil for plant growth. In this survey area, these breaks were made on the basis of plant communities and checks were made during the course of the survey to see if the soil temperature fell within these ranges. Landform breaks were made on the basis of photo interpretation, maps of surface geology of the area, and topographic maps. On similar landforms at similar elevations and under similar climatic regimes, similar soils with similar plant communities can be expected to have developed over time. Field mapping identified the major soils that had developed on these surfaces.

Actual field mapping was done in conjunction with information collected on the plant communities by range specialists. Delineations were made on aerial photographs with a stereoscope. These photographs show vegetation patterns, landforms, roads, drainage patterns, and other features that help the soil scientists draw accurate boundaries. These delineations were then checked in the field and the boundaries adjusted as needed.

In some delineations, numerous holes were dug to study soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. It extends from the

surface down into the parent material, which has been changed very little by leaching or by plant roots. In other delineations only a few holes were observed to determine if the soils met the soil characteristics observed on similar landscapes. Generally only the surface features, slope and kind and amount of vegetation were observed in the steeper areas to see if they matched the characteristics of soils in similar areas.

The information gathered by the soil scientists was compared with the information on the plant communities gathered by the range specialists to define map units, which are delineations on the soil maps, and the associated range sites. These map units are composed of one or more major kinds of soils or miscellaneous areas. Each map unit is expected to respond similarly to various uses and management. The naming of these units follows nationally established conventions. The map units used in this survey are described in the sections "General Soil Map Units" and "Detailed Soil Map Units." The percentage given for each major soil component or miscellaneous area in a map unit represents the general percentage for that map unit over the entire survey area. The actual percentage of each major component can be expected to vary from one delineation to another.

While a soil survey is in progress, samples of some soils are gathered for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, field experience, and state and local specialists; for example, range specialists estimated the kinds and amount of natural vegetation from transects and from clipping and weighing the annual production of the plant communities. These plant communities were then grouped into range sites.

Only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then is organized so that it can be used by farmers, rangeland and woodland managers, engineers, planners, developers and builders, home buyers, and others.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

General Soil Map Units

Thomas J. Carroll, biologist, Bureau of Land Management, helped to prepare this section.

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages.

Map Unit Descriptions

Dominantly well drained, nearly level to steep soils in an arid climatic zone

This group consists of six map units. It makes up about 45 percent of the survey area. The native vegetation is mainly shrubs and grasses.

The soils in this group are very shallow to very deep. They formed in residuum, alluvium, colluvium, and some eolian material derived dominantly from sandstone and marine shale.

The soils in this group are used as rangeland, wildlife habitat, and recreation.

1. Mesa-Mack-Thedalund family

Moderately deep and very deep, well drained, gently sloping and steep soils; on alluvial fan pediments

This map unit is in the central part of the survey area. It is on broad alluvial fan pediments above areas of marine shale. The Mesa and Mack soils have slopes of 2 to 6 percent, and the Thedalund family soils have slopes of 30 to 50 percent. The vegetation on the Mesa and Mack soils is mainly shadscale, galleta, and Indian ricegrass. The vegetation on the Thedalund family soils is mainly salina wildrye, shadscale, and broom snakeweed. Elevation is 4,100 to 5,200 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 50 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit makes up about 3 percent of the survey area. It is about 50 percent Mesa soils, 30 percent Mack soils, and 15 percent Thedalund family soils. The remaining 5 percent is components of minor extent.

Mesa soils are on alluvial fan pediments. These soils are very deep and well drained. They formed in mixed alluvium and conglomerate derived dominantly from sandstone. The soils are loamy throughout. Very gravelly loamy material is at a depth of 20 to 40 inches.

Mack soils are on alluvial fan pediments. These soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone and shale. The soils are loamy throughout.

Thedalund family soils are on back slope escarpments of alluvial fan pediments. These soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from shale and sandstone. The soils are loamy throughout. Weathered shale is at a depth of 20 to 40 inches.

Of minor extent in this unit are Chipeta soils that are on shale plains and hillsides and support mat saltbush and wedgeleaf saltbush and Trook soils that are on pediments and support shadscale, fourwing saltbush, and Indian ricegrass.

This unit is used mainly as rangeland, wildlife habitat, and recreation areas.

The vegetation in this unit provides marginal habitat for game species such as antelope and chukar. It also provides habitat for coyote, white-tailed prairie dog, desert cottontail, and black-tailed jackrabbit. Raptors use the unit as a hunting area; red-tailed hawk, golden eagle, and marsh hawk are the most common species.

2. Chipeta-Killpack-Blueflat

Very shallow to moderately deep, well drained, nearly level to steep soils; on shale plains and pediments

This map unit is in the central part of the survey area. It is characterized by shale pediments dissected by drainageways, broad flats on plains, and steep escarpments of Badland. Slope is 1 to 50 percent. The vegetation on the Chipeta and Blueflat soils is mainly mat saltbush, wedgeleaf saltbush, and galleta. The vegetation on the Killpack soil is mainly wedgeleaf saltbush, winterfat, and galleta. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 50 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit makes up about 19 percent of the survey area. It is about 45 percent Chipeta soils, 10 percent Killpack soils, and 5 percent Blueflat soils. The remaining 40 percent is components of minor extent.

Chipeta soils are on dissected shale pediments and plains. These soils are very shallow and shallow and well drained. They formed in alluvium and residuum derived dominantly from marine shale. The soils are clayey throughout. Weathered shale is at a depth of 5 to 20 inches.

Killpack soils are on shale plains and pediments. These soils are moderately deep and well drained. They formed in alluvium and residuum derived dominantly from shale. The soils are silty throughout. Weathered marine shale is at a depth of 20 to 40 inches.

Blueflat soils are on pediments. These soils are moderately deep and well drained. They formed in residuum derived dominantly from marine shale. Weathered shale is at a depth of 20 to 40 inches.

Of minor extent in this unit are areas of Badland on steep shale escarpments, Toddler family and Ravola family soils along drainageways, Thedalund family soils on north-facing side slopes, and Mesa soils on remnant alluvial fans.

This unit is used as rangeland, wildlife habitat, and recreation areas.

This unit has little value as habitat for wildlife because of the limited variety and quantity of vegetation. The areas along drainageways and near escarpments provide valuable habitat for wildlife. Black greasewood and scattered pockets of cottonwood provide cover for coyote and some birds. Small mammals such as white-tailed prairie dog and black-tailed jackrabbit also use these areas.

3. Toddler-Ravola-Glenton families

Very deep, well drained, nearly level and gently sloping soils; on alluvial fans and flood plains and along drainageways

This map unit is in the central and southern parts of the survey area. It is characterized by nearly level flood plains that are dissected by drainageways, some of which are deeply incised. Slope is 0 to 3 percent. The vegetation on the Toddler family and Glenton family soils is mainly mat saltbush, shadscale, galleta, and scattered black greasewood. The vegetation on the Ravola family soils is mainly black greasewood, seepweed, and alkali sacaton. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 51 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit makes up about 5 percent of the survey area. It is about 25 percent Toddler family soils, 25 percent Ravola family soils, and 20 percent Glenton family soils. The remaining 30 percent is components of minor extent.

Toddler family soils are on flood plains. These soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone and shale. The soils are loamy throughout. They are moderately to very strongly salt- and alkali-affected.

Ravola family soils are along drainageways. These soils are very deep and well drained. They formed in alluvium derived dominantly from shale. The soils are silty throughout. They are moderately to very strongly salt- and alkali-affected.

Glenton family soils are on valley flats and flood plains. These soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone. The soils are loamy throughout.

Of minor extent in this unit are Leeko soils on flats, Redbank family and Flatnose family soils along the Green and Colorado Rivers and in drainageways below the Book Cliffs, and Chipeta soils.

This unit is used as rangeland, wildlife habitat, and recreation areas. Small areas are used for irrigated crops. These areas are mainly along the Green and Colorado Rivers.

Areas of this unit where water is available provide valuable habitat for wildlife. Generally, the areas that support shrubs such as black greasewood and saltcedar provide most of the habitat for wildlife. Antelope use areas that support greasewood as bedding and kidding grounds. Coyote, deer, and bobcat use these areas and deep gullies for traveling. Cottonwood trees, which grow in areas where water is near the surface, provide nesting sites and roosting areas for raptors and other birds such as horned lark and sparrows. Deep gullies are used by swallows as nesting sites.

4. Badland-Rock outcrop-Muff family

Badland, Rock outcrop, and moderately deep, well drained, nearly level to steep soils; on hills

This map unit is in the central part of the survey area, south of Interstate 70. Slope is 1 to 50 percent. The vegetation on the Muff family soils is mainly galleta, Indian ricegrass, and wedgeleaf saltbush. Elevation is

4,000 to 4,700 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit makes up about 4 percent of the survey area. It is about 30 percent Badland, 25 percent Rock outcrop, and 10 percent Muff family soils. The remaining 35 percent is components of minor extent.

Badland consists of barren areas of actively eroding shale, shale interbedded with gypsum, and thin layers of sandstone.

Rock outcrop consists of barren areas of sandstone that occur as ledges, cliffs, and slickrock.

Muff family soils are on hills. These soils are moderately deep and well drained. They formed in alluvium, residuum, and colluvium derived dominantly from sandstone and shale. The soils are loamy throughout. Shale is at a depth of 20 to 40 inches.

Of minor extent in this unit are Hanksville family soils in steep areas, Moenkopie soils intermingled with areas of Rock outcrop, Leeko soils along drainageways, Nakai soils in concave areas, Valleycity soils on cuestas, and Ravola family soils along drainageways.

This unit is used as rangeland, wildlife habitat, and recreation areas.

This unit has little value as wildlife habitat because of the limited forage and cover. The areas of Badland and Rock outcrop provide roosting and nesting sites for a variety of birds, including horned lark, Brewer's sparrow, golden eagle, red-tailed hawk, and rough-legged hawks.

5. Rock outcrop-Nakai-Moenkopie

Rock outcrop, and shallow and deep, well drained, nearly level to moderately steep soils; on cuestas, structural benches, valley floors, and mesas

This map unit is in the south-central part of the survey area. It is characterized by broad, sloping structural benches and cuestas. Slope is 1 to 20 percent. The vegetation on the Nakai soils is mainly Indian ricegrass, fourwing saltbush, and shadscale. The vegetation on the Moenkopie soils is mainly shadscale, galleta, and blackbrush. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 51 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit makes up about 11 percent of the survey area. It is about 30 percent Rock outcrop, 20 percent Moenkopie soils, and 20 percent Nakai soils. The remaining 30 percent is components of minor extent.

Rock outcrop consists of barren areas of sandstone that occur as ledges, cliffs, monoliths, and slickrock.

Nakai soils are on valley sides and structural benches. These soils are deep and well drained. They formed in alluvium and some eolian material derived dominantly from sandstone. The soils are loamy throughout. Sandstone is at a depth of 40 to 60 inches.

Moenkopie soils are on cuestas and structural benches. These soils are shallow and well drained. They formed in residuum and eolian material derived dominantly from sandstone. The soils are loamy throughout. Sandstone is at a depth of 5 to 20 inches.

Of minor extent in the unit are Shalet soils that are underlain by weathered shale and sandstone, Sheppard soils that are in hummocks and other concave areas where eolian material has accumulated, Thedalund family soils on north-facing side slopes, and Valleycity soils on cuestas.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The blackbrush, galleta, and shadscale in this unit are used to some extent by mule deer. The unit also provides habitat for a variety of small mammals, including white-tailed prairie dog, desert cottontail, and black-tailed jackrabbit. Coyote and bobcat prey on the small mammals in the unit. Raptors, including horned lark, Brewer's sparrow, golden eagle, red-tailed hawk, and rough-legged hawk, use the unit as a hunting area.

6. Hanksville family-Walknolls family-Hostage

Very shallow to deep, well drained, gently sloping to very steep soils; on cuestas, structural benches, alluvial fans, and canyon escarpments

This map unit is in the northwestern part of the survey area. Slope is 3 to 80 percent. The vegetation on the Hanksville family soils is mainly galleta and wedgeleaf saltbush. The vegetation on the Walknolls family soils is mainly shadscale, galleta, and wedgeleaf saltbush. The vegetation on the Hostage soils is mainly Indian ricegrass, shadscale, and galleta. Elevation is 4,200 to 6,100 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 47 to 55 degrees F, and the average freeze-free season is 120 to 180 days.

This unit makes up about 3 percent of the survey area. It is about 35 percent Hanksville family soils, 25 percent Walknolls family soils, and 15 percent Hostage soils. The remaining 25 percent is components of minor extent.

Hanksville family soils are on side slopes of structural benches and cuestas. These soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from shale. About 10 to 70 percent of the surface is covered stones, pebbles, and boulders. The soils are clayey throughout. Shale is at a depth of 20 to 40 inches.

Walknolls family soils are on canyon escarpments. These soils are very shallow and shallow and are well drained. They formed in colluvium and residuum derived dominantly from sandstone and shale. About 15 to 80 percent of the surface is covered with boulders, stones, or channers. The soils are loamy and have boulders throughout. Sandstone or shale is at a depth of 5 to 20 inches.

Hostage soils are on alluvial fans. These soils are deep and well drained. They formed in alluvium over residuum derived dominantly from shale and sandstone. The soils are loamy throughout. Shale is at a depth of 40 to 60 inches.

Of minor extent in this unit are Pennell soils on structural benches, Lockerby soils on cuestas and benches, Shalako soils on benches, Killpack soils on alluvial fans, and Thedalund family soils on north-facing canyon escarpments.

This unit is used as rangeland, wildlife habitat, and recreation.

This unit is limited for use as rangeland because of inaccessibility resulting from the presence of steep canyons and isolated mesas.

This unit is used as wildlife habitat. The steeper areas of the unit are used by small mammals such as chipmunks and rock squirrels and by bighorn sheep. Chukars use these areas as cover and for forage. These areas also serve as travel corridors for mule deer, bobcat, mountain lion, and coyote. The areas that support blackbrush, galleta, and shadscale also provide habitat for mule deer. Horned lark, Brewer's sparrow, golden eagle, red-tailed hawk, and rough-legged hawk prey on the small mammals in this unit. The canyon walls provide roosting and nesting areas for raptors.

Dominantly well drained, gently sloping to very steep soils in a semi-arid climatic zone

This group consists of three map units. It makes up about 27 percent of the survey area. The native vegetation is mainly shrubs, grasses, and some Utah juniper.

The soils in this group are shallow to very deep and are well drained. They formed in alluvium, colluvium, residuum, and some eolian material derived dominantly from sandstone and shale.

This group is used as rangeland, wildlife habitat, and recreation areas.

7. Rock outcrop-Rizno-Begay

Rock outcrop, and very shallow, shallow, and very deep, well drained, gently sloping to moderately steep soils; on structural benches and cuestas

This map unit is in the southern part of the survey area. It is characterized by broad, sloping structural benches and cuestas and deep canyons. Slope is 2 to 20 percent. The vegetation on the Rizno soils is mainly blackbrush, Mormon-tea, pinyon, and Utah juniper. The vegetation on the Begay soils is mainly galleta, Indian ricegrass, Mormon-tea, needleandthread, fourwing saltbush, and some big sagebrush. Elevation is 4,700 to 6,400 feet. The average annual precipitation is about 8 to 12 inches, the mean annual air temperature is 47 to 54 degrees F, and the average freeze-free season is 110 to 170 days.

This unit makes up about 18 percent of the survey area. It is about 35 percent Rock outcrop, 15 percent Rizno and similar soils, and 10 percent Begay soils. The remaining 40 percent is components of minor extent.

Rock outcrop consists of barren areas of sandstone that occur as ledges, cliffs, monoliths, and slickrock.

Rizno soils are on cuestas and side slopes. These soils are very shallow and shallow and are well drained. They formed in residuum and eolian material derived dominantly from sandstone. The soils are loamy throughout. Sandstone is at a depth of 4 to 20 inches.

Begay soils are on cuestas and structural benches. These soils are very deep and well drained. They formed in eolian material and alluvium derived dominantly from sandstone. The soils are loamy throughout.

Of minor extent in this unit are Myton family soils on canyon escarpments, Sazi soils on structural benches and mesas, and Mido soils in areas where eolian material has accumulated.

This unit is used as rangeland, wildlife habitat, and recreation.

This unit is limited for use as wildlife habitat. Desert bighorn sheep are in the areas of the unit adjacent to the Canyonlands National Park. Small mammals such as white-tailed prairie dog, desert cottontail, and black-tailed jackrabbit use the areas that support Utah juniper, pinyon, blackbrush, fourwing saltbush, Indian ricegrass, and galleta. Predators such as coyote prey on the small mammals in this unit. Raptors use this unit as a hunting area, and they use the canyon escarpments for roosting and nesting.

8. Thedalund family-Hanksville family-Shalako

Shallow and moderately deep, well drained, gently sloping to very steep soils; on structural benches, mesas, cuestas, and escarpments

This map unit is in the central part of the survey area, immediately below the Book Cliffs, and in the eastern part of the survey area, above the Colorado River. It is mainly on south-facing escarpments of the Book Cliffs, on lower benches, and on mesas below the Book Cliffs (fig. 1). Slope is 3 to 70 percent. The vegetation on the Thedalund family soils is mainly salina wildrye, shadscale, and wedgeleaf saltbush. The vegetation on the Hanksville family soils is mainly mat saltbush, wedgeleaf saltbush, and shadscale. The vegetation on the Shalako soils is mainly Utah juniper, shadscale, and big sagebrush. Elevation is 4,200 to 6,800 feet. The average annual precipitation is about 6 to 14 inches, the mean annual air temperature is 46 to 54 degrees F, and the average annual freeze-free season is 100 to 160 days.

This unit makes up about 5 percent of the survey area. It is about 35 percent Thedalund family soils, 10 percent Hanksville family soils, and 10 percent Shalako soils that

Figure 1.—An area of general soil map unit 8.

are dry. The remaining 45 percent is components of minor extent.

Thedalund family soils are on canyon escarpments. These soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from sandstone and interbedded shale. About 5 to 80 percent of the surface is covered with boulders, stones, and cobbles. The soils are loamy throughout. Sandstone or shale is at a depth of 20 to 40 inches.

Hanksville family soils are on escarpments and mesas. These soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from shale. About 15 to 80 percent of the surface is

covered with boulders, flagstones, and channers. The soils are loamy throughout.

Shalako soils are on cuestas and benches. These soils are shallow and well drained. They formed in residuum and alluvium derived dominantly from sandstone. About 5 to 50 percent of the surface is covered with gravel, cobbles, and channers. The soils are loamy throughout. Sandstone is at a depth of 10 to 20 inches.

Of minor extent in this unit are areas of Badland on south-facing shale escarpments; Hostage and Killpack soils on the lower part of alluvial fans; Strych soils on the upper part of alluvial fans; Barx and Mack soils and Sazi soils, loamy, on cuestas and benches; and Rock outcrop.

This unit is used as rangeland, wildlife habitat, and recreation areas.

This unit provides a variety of habitat types because of the complexity of the terrain. Some of the drainageways in the Book Cliffs also provide perennial sources of water. The highly dissected cuestas at the base of the Book Cliffs provide some cover. The steeper areas on the face of the canyons are used primarily as migratory corridors by coyote, bobcat, and mountain lion and as nesting and roosting sites for raptors. Sagebrush parks on the cuestas provide winter browse for mule deer and antelope. Utah juniper and pinyon on the edge of cuestas provide cover.

9. Barx-Strych-Sandoval

Shallow and very deep, nearly level to gently sloping soils; on alluvial fans and shale pediments

This map unit is in the east-central part of the survey area. It is mainly on alluvial fans and alluvial fan pediments below the Book Cliffs. Slope is 1 to 15 percent. The vegetation on the Barx soils is mainly Wyoming big sagebrush, galleta, and spiny hopsage. The vegetation on the Strych soils is mainly Utah juniper, pinyon, salina wildrye, and galleta. The vegetation on the Sandoval soils is mainly salina wildrye, shadscale, and some wedgeleaf saltbush. Elevation is 4,700 to 6,200 feet. The average annual precipitation is about 8 to 13 inches, the mean annual air temperature is 46 to 54 degrees F, and the average freeze-free season is 120 to 150 days.

This unit makes up about 4 percent of the survey area. It is about 40 percent Barx soils, 15 percent Strych soils, and 15 percent Sandoval soils. The remaining 30 percent is components of minor extent.

Barx soils are on alluvial fans. These soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone and shale. The soils are loamy throughout.

Strych soils are on alluvial fans. These soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone and conglomerate. The soils are loamy and have stones throughout.

Sandoval soils are on shale pediments. These soils are shallow and well drained. They formed in residuum and alluvium derived dominantly from marine shale. The soils are loamy throughout. Shale is at a depth of 10 to 20 inches.

Of minor extent in this unit are Killpack soils on shale pediments, Thedalund family soils on shale escarpments, Abra soils on alluvial fan pediments, and Redbank family soils in drainageways.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The areas of this unit where Utah juniper and pinyon are interspersed with sagebrush parks and where basin big sagebrush is on the bottoms of drainageways provide the most valuable habitat for wildlife. Mule deer and antelope use these areas for cover and as bedding and kidding grounds. The sagebrush parks are used for forage. Some small mammals also use the habitat in this unit. Most of the birds in the unit are sage sparrow and black-throated sparrow. Raptors use the unit for hunting. Some of the escarpments on the pediments are used as roosting areas.

Dominantly well drained, steep and very steep soils in semi-arid and dry subhumid climatic zones

This group consists of one map unit. It makes up about 8 percent of this survey area. The native vegetation is mainly shrubs, grasses, pinyon, and Utah juniper.

The soils in this group are moderately deep and deep and are well drained. They formed in colluvium and residuum derived dominantly from sandstone and interbedded shale.

This group is used as rangeland, wildlife habitat, and recreation.

10. Thedalund family-Dast family

Moderately deep and deep, well drained, steep and very steep soils; on canyon escarpments and mountainsides

This map unit is in the northern part of the survey area. It is mainly on canyon escarpments and mountainsides in the Book Cliffs. Slope is 50 to 80 percent. The vegetation on the Thedalund family soils that are moist is mainly Utah juniper, pinyon, and salina wildrye. The vegetation on the Dast family soils is mainly pinyon, Utah juniper, birchleaf mountainmahogany, and serviceberry. The vegetation on the Thedalund family soils that are stony is mainly salina wildrye, shadscale, and some wedgeleaf saltbush. Elevation is 4,400 to 7,700 feet. The average annual precipitation is about 8 to 16 inches, the mean annual air temperature is 41 to 50 degrees F, and the average freeze-free season is 70 to 160 days.

This unit makes up about 8 percent of the survey area. It is about 45 percent Thedalund family soils that are moist; 25 percent Dast family soils; and 5 percent

Thedalund family soils that are stony. The remaining 25 percent is components of minor extent.

Thedalund family soils that are moist are on north- and west-facing canyonsides and mountainsides. These soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from sandstone and interbedded shale. About 10 to 75 percent of the surface is covered with stones, boulders, and cobbles. The soils are loamy throughout. Sandstone or shale is at a depth of 20 to 40 inches.

Dast family soils are on north-facing canyonsides and mountainsides. These soils are moderately deep and deep and are well drained. They formed in colluvium and residuum derived dominantly from sandstone and shale. The surface is covered with a mat of partially decomposed leaves, twigs, and needles. The soils are loamy throughout. Sandstone or shale is at a depth of 20 to 60 inches.

Thedalund family soils that are stony are on south-facing canyon escarpments. These soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from sandstone and interbedded shale. About 5 to 80 percent of the surface is covered with boulders, stones, and cobbles. The soils are loamy throughout. Sandstone or shale is at a depth of 20 to 40 inches.

Of minor extent in this unit are Shalako soils on benches and ridgetops, Reva family and Falcon family soils on steep, north-facing side slopes, Bookcliff soils on mountainsides and landslides, Flatnose soils in valley bottoms, and Rock outcrop.

This unit is used as rangeland, wildlife habitat, and recreation.

This unit is limited for use by livestock because of the steepness of slope. The areas most valuable as habitat for wildlife are along the canyon floors where water and cover are available. These areas are used by mule deer and elk during severe winters, when there is heavy snow at the higher elevations. Small mammals such as chipmunks, rock squirrels, and pack rats and sparrows, horned lark, pinyon jay, and chukars use the habitat in the steeper areas. Raptors use the canyon rims and the snags in the steeper areas for hunting, roosting, and nesting.

Dominantly well drained, gently sloping to very steep soils in a subhumid climatic zone

This group consists of two map units. It makes up about 20 percent of the survey area. The native vegetation is mainly shrubs, grasses, pinyon, Utah juniper, and Gambel oak.

The soils in this group are shallow to deep and are well drained. They formed in colluvium and residuum derived dominantly from sandstone and shale.

This group is used as rangeland, wildlife habitat, and recreation.

11. Shalako-Dast family-Reva family

Shallow to deep, well drained, nearly level to very steep soils; on benches and mountainsides

This map unit is in the northern part of the survey area. It is mainly on north-facing mountainsides at lower elevations and on south-facing mountainsides at higher elevations. Landslides and old slumps are throughout the unit. Slope is 1 to 80 percent. The vegetation on the Shalako soils is mainly pinyon, Utah juniper, birchleaf mountainmahogany, and cliffrose. The vegetation on the Dast family soils is mainly pinyon, Utah juniper, birchleaf mountainmahogany, and serviceberry. The vegetation on the Reva family soils is mainly pinyon, Douglas-fir, curlleaf mountainmahogany, and Utah juniper. Elevation is 5,200 to 8,600 feet. The average annual precipitation is about 12 to 16 inches, the mean annual air temperature is 39 to 50 degrees F, and the average freeze-free season is 70 to 110 days.

This unit makes up about 14 percent of the survey area. It is about 25 percent Shalako soils that are moist, 20 percent Dast family soils, and 20 percent Reva family soils. The remaining 35 percent is components of minor extent.

Shalako soils are on benches and cuestas. These soils are shallow and well drained. They formed in residuum derived dominantly from sandstone. The soils are loamy throughout. Sandstone is at a depth of 10 to 20 inches.

Dast family soils are on steep and very steep mountainsides. These soils are moderately deep and deep and are well drained. They formed in colluvium and residuum derived dominantly from sandstone and shale. The surface is covered with a mat of partially decomposed leaves, twigs, and needles. About 5 to 75 percent of the surface is covered with boulders and stones. The soils are loamy throughout. Sandstone or shale is at a depth of 20 to 60 inches.

Reva family soils are on steep and very steep °mountainsides. These soils are shallow and well drained. They formed in colluvium and residuum derived dominantly from sandstone. About 15 to 80 percent of the surface is covered with channers, stones, and boulders. The soils are loamy and have stones throughout. Sandstone is at a depth of 3 to 20 inches.

Of minor extent in this unit are Falcon family soils intermingled with areas of the Reva family soils, Flatnose soils on valley floors, Bookcliff soils on benches and mountainsides, Thedalund family soils on steep, south-facing side slopes, and Rock outcrop.

This unit is used as rangeland, wildlife habitat, and recreation.

This unit is limited for use by livestock because of the steepness of slope. The areas of this unit near valley floors where water, browse, and cover are available provide the most valuable habitat for wildlife. Utah serviceberry and curlleaf mountainmahogany provide

browse for mule deer. Small mammals such as rock squirrels, chipmunks, and mice and chukars use the steeper areas for cover and forage. Old growth timber and snags provide habitat for wildlife such as kestrel and woodpeckers and insectivores. Predators such as coyote, bobcat, and mountain lion and raptors use the unit for hunting.

12. Razorba family-Sula family-Reva family

Very shallow to very deep, well drained, steep and very steep soils; on mountainsides

This map unit is in the northern part of the survey area, at the higher elevations in the Book Cliffs. It is mainly on mountainsides. Old slumps and landslides are common throughout the unit. Slope is 50 to 80 percent. The vegetation on the Razorba family soils is mainly Gambel oak, mountain big sagebrush, and snowberry. The vegetation on the Sula family soils is mainly Douglas-fir, snowberry, and pinyon. The vegetation on the Reva family soils is mainly pinyon, Douglas-fir, curlleaf mountainmahogany, and Utah juniper. Elevation is 5,900 to 9,000 feet. The average annual precipitation is about 14 to 24 inches, the mean annual air temperature is 35 to 44 degrees F, and the average freeze-free season is 30 to 90 days.

This unit makes up about 6 percent of the survey area. It is about 30 percent Razorba family soils, 20 percent Sula family soils, and 20 percent Reva family soils. The remaining 30 percent is components of minor extent.

Razorba family soils are on steep and very steep mountainsides. These soils are deep and very deep and are well drained. They formed in colluvium and residuum derived dominantly from sandstone and shale. The surface is covered with a mat of partially decomposed leaves, twigs, and needles. The soils are loamy throughout. Sandstone is at a depth of 40 to 60 inches or more.

Sula family soils are on steep and very steep mountainsides. These soils are moderately deep and deep and are well drained. They formed in colluvium and residuum derived dominantly from sandstone and shale. The surface is covered with a mat of partially decomposed leaves, twigs, and needles. About 5 to 70 percent of the surface is covered with boulders, stones, cobbles, and pebbles. The soils are loamy throughout. Sandstone is at a depth of 20 to 60 inches.

Reva family soils are on steep and very steep, south-facing mountainsides. These soils are very shallow and shallow and are well drained. They formed in colluvium and residuum derived dominantly from sandstone. About 15 to 80 percent of the surface is covered with channers, stones, and boulders. The soils are loamy and have stones throughout. Sandstone is at a depth of 3 to 20 inches.

Of minor extent in this unit are Hub family soils on steep and very steep, north-facing mountainsides, Falcon family soils on steep and very steep, south-facing mountainsides, Skylick soils on benches, Flatnose soils on valley floors, and Rock outcrop.

The unit is used as rangeland, wildlife habitat, and recreation.

This unit is limited for use as by livestock because of the steepness of slope. The unit provides very valuable habitat for wildlife. The valley floors provide water, cover, and forage. Some of the perennial streams have potential for development of fisheries. Beavers are active along some of the streams. The streams also provide habitat for amphibians, reptiles, small mammals, and birds. The diversity of the habitat on this unit leads to use by large mammals such as deer and elk. The unit also provides habitat for predators such as black bear, mountain lion, bobcat, and coyote.

The diverse tree species in the unit provide roosting and nesting sites for raptors and other birds and for insectivores. The aquatic habitat in the unit is used by birds such as ducks, swallows, and sandpipers.

The big sagebrush and other plants such as mountainmahogany and Utah serviceberry in the sloping to steep areas and on mesa tops provide browse for wildlife. The aspen, oak, and shrubs in the steeper areas provide cover and forage and serve as calving and fawning sites for deer, elk, and small mammals. Dense stands of old growth Douglas-fir provide travel corridors for large mammals.

This unit is used as a hunting area for raptors such as golden eagle, red-tailed hawk, and owls. Sage grouse are present particularly in sagebrush parks at the high elevations.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Shalako gravelly sandy loam, 3 to 8 percent slopes, is one of several phases in the Shalako series.

Some soils have not been defined in the detail necessary to place into a soil series. These are identified at the soil family level, which is the next higher level within soil taxonomy. A reference pedon is provided to indicate the general characteristics of the soils as they occur in the survey area. Interpretations for the uses of these soils are broader than those made for a soil series. An example of a soil family map unit is Hub family, 50 to 80 percent slopes.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately

on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Bookcliff-Shalako is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Redbank-Flatnose families association is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

1—Abra-Barx complex. This map unit is on alluvial fans and fan terraces east of Bitter Creek, near the Colorado state line. Slope is 1 to 15 percent. Elevation is 4,900 to 5,500 feet. The average annual precipitation is 9 to 12 inches, the mean annual air temperature is 47 to 51 degrees F, and the average freeze-free season is 130 to 150 days.

This unit is 60 percent Abra fine sandy loam, 5 to 15 percent slopes, on convex side slopes of alluvial fans and fan terraces, and 20 percent Barx fine sandy loam, 1 to 5 percent slopes, on alluvial fans and fan terraces. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 5 percent moderately deep, loamy soils that have a layer that is strongly cemented with calcium carbonate and are on the higher remnant fans; 5 percent very deep, stony soils on slope breaks; 5 percent very deep, stratified soils that are in drainageways and and support basin big sagebrush and greasewood; and 5 percent shallow, loamy soils that are on ridgetops and support Utah juniper.

The Abra soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone and conglomerate. Slopes are less than 25 feet long and are on east, west, and south aspects. The present vegetation in most areas is Wyoming big sagebrush, fourwing saltbush, shadscale, Indian ricegrass, galleta, and scattered Utah juniper. Typically, 10 percent of the surface is covered with pebbles. The surface layer is yellowish brown fine sandy loam 7 inches thick. The next layer is very pale brown fine sandy loam and sandy clay loam 16 inches thick. Below this to a depth of 60 inches or more is light yellowish brown sandy loam and sandy clay loam.

Permeability of the Abra soil is moderate. Available water capacity is about 6.5 to 10.5 inches. Water supplying capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Barx soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone. Slopes are convex, are less than 50 feet long, and are on south and east aspects. The present vegetation in most areas is Wyoming big sagebrush, spiny hopsage, shadscale, galleta, and Indian ricegrass. Typically, the surface layer is brown fine sandy loam 2 inches thick. The upper 11 inches of the subsoil is brown and yellowish red clay loam, the next 9 inches is yellowish red loam, and the lower part to a depth of 33 inches is pink sandy clay loam. The substratum to a depth of 60 inches or more is white sandy loam.

Permeability of the Barx soil is moderate. Available water capacity is about 8.0 to 10.5 inches. Water supplying capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Abra and Barx soils is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Indian ricegrass, galleta, Wyoming big sagebrush, and winterfat. In areas where a large percentage of the potential plant community has been removed, Utah juniper and pinyon may invade.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the desirable forage plants are depleted, brush management and rangeland seeding can be used to improve the rangeland vegetation. Suitable brush management practices include prescribed burning and chemical and mechanical treatment.

The suitability of the unit for rangeland seeding is fair. The main limitation is the low annual precipitation. Plants suitable for seeding include those native to the unit and crested wheatgrass, ladak alfalfa, and prostrate kochia.

This map unit is in capability subclass VIe. It is in Semidesert Loam (Wyoming Big Sagebrush) range site.

2—Barx fine sandy loam. This very deep, well drained soil is on alluvial fans and fan terraces east of Nash Wash. It formed in alluvium derived dominantly from sandstone. Slopes are 1 to 5 percent. They are convex or concave, are less than 50 feet long, and are

on south and east aspects. The present vegetation in most areas is Wyoming big sagebrush, spiny hopsage, shadscale, and galleta (fig. 2). Elevation is 5,000 to 5,500 feet. The average annual precipitation is 9 to 12 inches, the mean annual air temperature is 47 to 51 degrees F, and the average freeze-free season is 130 to 150 days.

Typically, the surface layer is brown fine sandy loam 2 inches thick. The upper 11 inches of the subsoil is brown and yellowish red clay loam, the next 9 inches is yellowish red loam, and the lower part to a depth of 33 inches is pink sandy clay loam. The substratum is white sandy loam to a depth of more than 60 inches.

Included in this unit are 10 percent very deep, stony soils that are in concave areas along drainageways and support pinyon and Utah juniper, and 10 percent moderately deep, loamy soils that are on ridgetops and support Wyoming big sagebrush and fourwing saltbush.

Permeability of the Barx soil is moderate. Available water capacity is 8.0 to 10.5 inches. Water supplying capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Barx soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Indian ricegrass, galleta, Wyoming big sagebrush, and winterfat. In areas where a large percentage of the potential plant community has been removed, Utah juniper and pinyon may invade.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing system, and proper location of water developments. If the desirable forage plants are depleted, brush management and rangeland seeding can

Figure 2.—Area of Barx fine sandy loam on broad alluvial fans below the Book Cliffs. Wyoming big sagebrush, winterfat, Indian ricegrass, and galleta are in foreground.

be used to improve the vegetation. Suitable brush management practices include prescribed burning and chemical and mechanical treatment. The suitability of the unit for rangeland seeding is fair. The main limitation is low annual precipitation. Plants suitable for seeding include those native to the unit and crested wheatgrass, ladak alfalfa, and prostrate kochia.

This map unit is in capability subclass VIc. It is in Semidesert Loam (Wyoming Big Sagebrush) range site.

3—Begay Variant fine sandy loam, 3 to 15 percent slopes. This very deep, well drained soil is on structural benches between Right Hand Tusher and Floy Canyons, in the Book Cliffs. It formed in alluvium derived dominantly from sandstone and shale. Slopes are convex and are less than 100 feet long. The present vegetation in most areas is basin big sagebrush, rubber rabbitbrush, sand dropseed, and Hood phlox. Elevation is 6,300 to 6,500 feet. The average annual precipitation is 12 to 14 inches, the mean annual air temperature is 45 to 48 degrees F, and the average freeze-free season is 70 to 100 days.

Typically, the surface layer is brown fine sandy loam 2 inches thick. The subsoil is brown loam 9 inches thick. The upper 8 inches of the substratum is brown fine sandy loam, the next 17 inches is light brown gravelly fine sandy loam and fine sandy loam, and the lower part to a depth of 60 inches or more is light brown very gravelly fine sandy loam.

Included in this unit are 10 percent very deep, loamy soils that are on north aspects and support Gambel oak and 10 percent shallow soils that are on ridgetops and support pinyon and Utah juniper.

Permeability of the Begay Variant soil is moderately rapid. Available water capacity is 4.5 to 7.0 inches. Water supplying capacity is 5 to 8 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Begay Variant soil is about 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are western wheatgrass, big sagebrush, needleandthread, Indian ricegrass, Nevada bluegrass, muttongrass, and bluebunch wheatgrass. Dense stands of big sagebrush may develop with continuous overgrazing.

Practices needed to maintain or improve the vegetation include a planned grazing system, proper grazing use, and proper location of livestock watering developments. Brush management by prescribed burning or by chemical or mechanical treatment can be used to improve areas of deteriorated rangeland.

Seeding may be advisable if the plant community is in poor condition. Plants suitable for seeding include Russian wildrye, intermediate wheatgrass, pubescent wheatgrass, alfalfa, small burnet, prostrate kochia, and native plants for which plant materials are available.

This map unit is in capability subclass VIe. It is in Upland Loam (Basin Big Sagebrush) range site.

4—Begay-Sazi complex. This map unit is in undulating parks on broad cuestas and structural benches in the southern part of the survey area, between the Green and Colorado Rivers. Slope is 2 to 10 percent. Elevation is 4,700 to 6,300 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 130 to 170 days.

This unit is 65 percent Begay fine sandy loam, 2 to 10 percent slopes, and 20 percent Sazi fine sandy loam, dry, 2 to 10 percent slopes. The Sazi soil is near areas of Rock outcrop and Rizno soils. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent shallow Rizno soils; 5 percent very deep, sandy soils; and 5 percent Rock outcrop. The Rizno soils are near areas of Rock outcrop on ridges, and the very deep, sandy soils are in depressional areas where windblown sediment has accumulated.

The Begay soil is very deep and well drained. It formed in eolian material and some alluvium derived dominantly from sandstone. Slope ranges from 2 to 10 percent but is commonly 2 to 5 percent. Slopes commonly are more than 300 feet long. The present vegetation in most areas is galleta, Indian ricegrass, Mormon-tea, needleandthread, and fourwing saltbush. Typically, the surface layer is yellowish red fine sandy loam 5 inches thick. The subsoil is yellowish red fine sandy loam 21 inches thick. The upper 11 inches of the substratum is reddish yellow fine sandy loam, and the lower part to a depth of 60 inches or more is light reddish brown fine sandy loam.

Permeability of the Begay soil is moderately rapid. Available water capacity is 6.5 to 9.5 inches. Water supplying capacity is 5.0 to 6.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 2 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Sazi soil is moderately deep and well drained. It formed in eolian material and some alluvium derived dominantly from sandstone. Slope ranges from 2 to 10 percent but is commonly 2 to 5 percent. Slopes commonly are more than 300 feet long. The present vegetation in most areas is galleta, Indian ricegrass, Mormon-tea, needleandthread, and some fourwing saltbush. Typically, the surface layer is strong brown fine sandy loam 4 inches thick. The subsoil is yellowish red fine sandy loam 13 inches thick. The substratum is reddish yellow fine sandy loam 17 inches thick.

Sandstone is at a depth of 34 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Sazi soil is moderately rapid. Available water capacity is 3.5 to 6.0 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 2 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on this unit is 60 percent grasses, 15 percent forbs, and 25 percent shrubs. Important plants are needleandthread, Indian ricegrass, and fourwing saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. If the desirable forage plants are depleted, brush management and seeding can be used to improve the rangeland vegetation. Suitable brush management practices include prescribed burning and chemical and mechanical treatment.

The suitability of this unit for rangeland seeding is fair. The main limitation is low annual precipitation. Plants suitable for seeding include adapted native plants, crested wheatgrass, and ladak alfalfa.

This map unit is in capability subclass VIIe and in Semidesert Sandy Loam range site.

5—Begay-Sazi-Rizno complex. This map unit is on structural benches and cuestas in the vicinity of Dome Plateau, east of Arches National Monument. Slope is 10 to 20 percent. Elevation is 4,700 to 6,000 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 130 to 150 days.

This unit is 40 percent Begay fine sandy loam; 20 percent Sazi fine sandy loam, dry; and 20 percent Rizno fine sandy loam. The Begay and Sazi soils are mostly in concave areas of benches, and the Rizno soil is on ridges and adjacent to areas of Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Rock outcrop and 10 percent very deep, sandy soils. Rock outcrop occurs as ledges, monoliths, and slick rock throughout the unit. The very deep, sandy soils are in small, isolated depressional areas where eolian material has accumulated.

The Begay soil is very deep and well drained. It formed in eolian material and some alluvium derived dominantly from sandstone. Slope ranges from 10 to 20 percent but is commonly less than 15 percent. Slopes commonly are 100 to 200 feet long. The present vegetation in most areas is galleta, Indian ricegrass, Mormon-tea, needleandthread, fourwing saltbush, and some basin big sagebrush. Typically, the surface layer is reddish yellow fine sandy loam 5 inches thick. The subsoil is reddish yellow fine sandy loam 21 inches thick. The upper 11 inches of the substratum is reddish yellow fine sandy loam, and the lower part to a depth of 60 inches or more is light brown sandy loam.

Permeability of the Begay soil is moderately rapid. Available water capacity is 6.5 to 9.5 inches. Water supplying capacity is 5.0 to 6.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 2 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Sazi soil is moderately deep and well drained. It formed in eolian material and some alluvium derived dominantly from sandstone. Slope ranges from 10 to 20 percent but is commonly less than 15 percent. Slopes commonly are less than 50 feet long. The present vegetation in most areas is galleta, Indian ricegreass, Mormon-tea, needleandthread, some fourwing saltbush, and blackbrush. Typically, the surface layer is strong brown fine sandy loam 4 inches thick. The subsoil is strong brown sandy loam 13 inches thick. The substratum is pink sandy loam 17 inches thick. Sandstone is at a depth of 34 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Sazi soil is moderately rapid. Available water capacity is 3.5 to 6.0 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 2 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Rizno soil is very shallow and shallow and is well drained. It formed in residuum and eolian material derived dominantly from sandstone. Slopes are convex and are less than 50 feet long. The present vegetation in most areas is blackbrush, Utah juniper, pinyon, and Mormon-tea. Typically, the surface layer is reddish yellow fine sandy loam about 2 inches thick. The next layer is yellowish red channery fine sandy loam 6 inches thick. Sandstone is at a depth of 8 inches. Depth to sandstone ranges from 4 to 20 inches.

Permeability of the Rizno soil is moderately rapid. Available water capacity is less than 2.5 inches. Water supplying capacity is 1 to 3 inches. Effective rooting depth is 4 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas. It is also a potential source of Utah juniper firewood and small amounts of pinyon wood products.

The potential plant community on Begay and Sazi soils is 60 percent grasses, 15 percent forbs, and 25 percent

shrubs. Important plants are needleandthread, Indian ricegrass, and fourwing saltbush.

The potential vegetation on Rizno soil is an overstory of Utah juniper and pinyon with a canopy of 15 percent. The understory vegetation is 20 percent grasses, 15 percent forbs, and 65 percent shrubs. Important plants are blackbrush, bluegrass, galleta, Indian ricegrass, and Mormon-tea.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. It is not practical to revegetate large areas because of the restricted depth of the Rizno soil, competition from Utah juniper and pinyon, and low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

The site index for Utah juniper and pinyon on the Rizno soil is 40. Average yields are 4.5 cords of wood per acre. The potential is poor for post or Christmas tree production.

This map unit is in capability subclass VIIe. The Begay and Sazi soils are in Semidesert Sandy Loam range site, and the Rizno soil is in Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon) range site.

6—Begay-Rizno complex. This map unit is on structural benches between the Colorado and Green Rivers. Slope is 2 to 10 percent. Elevation is 4,700 to 6,100 feet. The average annual precipitation is about 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 140 to 170 days.

This unit is 60 percent Begay fine sandy loam and 20 percent Rizno fine sandy loam. The Begay soil is in the concave or convex, open areas, and the Rizno soil is adjacent to areas of Rock outcrop and in convex areas on ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent moderately deep, loamy soils that are near areas of the Rizno soil and support fourwing saltbush and Indian ricegrass, 5 percent very deep, sandy soils in concave areas, and 5 percent Rock outcrop.

The Begay soil is very deep and well drained. It formed in eolian material and some alluvium derived dominantly from sandstone. Slopes range from 2 to 10 percent but are commonly 2 to 5 percent. Slopes commonly are 200 to 300 feet long or more. The present vegetation in most areas is galleta, Indian ricegrass, Mormon-tea, and needleandthread. Typically, the surface layer is yellowish red fine sandy loam about 5 inches thick. The subsoil is yellowish red fine sandy loam about 21 inches thick. The upper 11 inches of the substratum is reddish yellow fine sandy loam, and the lower part to a depth of 60 inches is light reddish brown fine sandy loam.

Permeability of the Begay soil is moderately rapid. Available water capacity is about 6.5 to 9.5 inches. Water supplying capacity is 5.0 to 6.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 2 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Rizno soil is very shallow and shallow and is well drained. It formed in residuum and eolian material derived dominantly from sandstone. Slopes are convex and are less than 50 feet long. The present vegetation in most areas is blackbrush, Mormon-tea, Utah juniper, and pinyon. Typically, the surface layer is light red fine sandy loam about 2 inches thick. The underlying material is red gravelly fine sandy loam 6 inches thick. Sandstone is at a depth of 8 inches. Depth to sandstone ranges from 4 to 20 inches.

Permeability of the Rizno soil is moderately rapid. Available water capacity is less than 2.5 inches. Water supplying capacity is 1 to 3 inches. The organic matter content of the surface layer is about 1 percent. Effective rooting depth is 4 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas. The unit is also a source of Utah juniper firewood and small amounts of pinyon wood products.

The potential plant community on Begay soil is 60 percent grasses, 15 percent forbs, and 25 percent shrubs. Important plants are needleandthread, Indian ricegrass, and fourwing saltbush.

The potential vegetation on Rizno soil is an overstory of Utah juniper and pinyon with a canopy of 15 percent. The understory vegetation is 20 percent grasses, 15 percent forbs, and 65 percent shrubs. Important plants are blackbrush, bluegrass, galleta, Indian ricegrass, and Mormon-tea.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. It is not practical to revegetate large areas because of the restricted depth of the Rizno soil, competition from Utah juniper and pinyon, and low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants, prostrate kochia, crested wheatgrass, and ladak alfalfa.

The site index for Utah juniper and pinyon on the Rizno soil is 40. Average yields are 4.5 cords of wood per acre. The potential is poor for post or Christmas tree production.

This map unit is in capability subclass VIIe. The Begay soil is in Semidesert Sandy Loam range site, and the Rizno soil is in Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon) range site.

7—Blueflat complex. This map unit is on uplifted parts of pediments and on ridges south of Interstate 70 and north of Arches National Park. The pediments are dissected by numerous parallel drainageways. Slope ranges from 2 to 25 percent but commonly is 10 to 20 percent. Slopes are convex or concave and are generally less than 50 feet long. Elevation is 4,500 to 4,900 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is about 55 percent Blueflat loam and 30 percent Blueflat loam, saline. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent shallow, clayey soils that have accumulations of gypsum and are on slope breaks and 5 percent very deep, silty soils in drainageways.

The Blueflat loam is moderately deep and well drained. It formed in residuum derived dominantly from marine shale. The present vegetation in most areas is galleta, wedgeleaf saltbush, bud sagebrush, and Indian ricegrass. Typically, about 10 percent of the surface is covered with pebble-sized channery fragments of sandstone, siltstone, or hard shale. The surface layer is light yellowish brown loam about 6 inches thick. The subsoil is yellowish brown silty clay loam about 3 inches thick. The substratum is light yellowish brown and light olive brown, gypsiferous silty clay about 18 inches thick over strongly weathered shale. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of this Blueflat soil is slow. Available water capacity is 2.5 to 6.0 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The Blueflat loam, saline, is moderately deep and well drained. It formed in residuum derived dominantly from marine shale. The present vegetation in most areas is mat saltbush with scattered wedgeleaf saltbush, galleta, and Indian ricegrass. Typically, about 30 percent of the surface is covered with pebble-sized channery fragments of sandstone, siltstone, or hard shale. The surface layer is light yellowish brown loam about 4 inches thick. The subsoil is yellowish brown silty clay loam about 3 inches thick. The upper 9 inches of the substratum is pale brown silty clay loam, and the lower part to a depth of 28 inches is grayish brown clay. Highly weathered shale is at a depth of 28 inches. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of this Blueflat soil is slow. Available water capacity is 3 to 6 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Blueflat loam is 30 to 40 percent grasses, 10 to 15 percent forbs, and 45 to 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and winterfat. The potential plant community on the Blueflat loam, saline, is 10 to 15 percent grasses, 10 to 15 percent forbs, and 70 to 80 percent shrubs. Important plants are galleta, deserttrumpet, mat saltbush, and bud sagebrush. Spring grazing on this unit generally results in a decrease in the desirable forage plants and an increase in the less desirable grasses and shrubs. Severe drought in some years may adversely affect perennial vegetation. Partial or total removal of livestock from the range in these years is a good practice.

The suitability of this unit for rangeland seeding is poor. Low annual precipitation, low available water capacity, and high salt content in the underlying material limit seeding. Revegetation with species grown as nursery stock and transplanted may be successful. Contour plowing of disturbed areas reduces runoff and erosion and allows snowmelt to collect in the furrows.

This map unit is in capability subclass VIIs. The Blueflat loam is in Desert Clay range site, and the Blueflat loam, saline, is in Desert Shallow Clay range site.

8—Blueflat-Neiber complex. This map unit is on broad pediments and structural benches in the east-central part of the survey area. Slope is 2 to 25 percent. Slopes are smooth to concave and are 100 to 200 feet long. Elevation is 4,500 to 4,900 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 150 to 170 days.

This unit is 45 percent Blueflat loam, 2 to 25 percent slopes, and 30 percent Neiber silt loam, 2 to 15 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 10 percent moderately deep, loamy soils on the steeper, north-facing slopes, 10 percent shallow, clayey soils that are on ridges and support mat saltbush, and 5 percent very deep, silty soils in drainageways.

The Blueflat soil is moderately deep and well drained. It formed in residuum derived from marine shale. The

present vegetation in most areas is wedgeleaf saltbush, galleta, mat saltbush, and shadscale. Typically, 10 percent of the surface is covered with pebble-sized channery fragments of sandstone, siltstone, or hard shale. The surface layer is yellowish brown loam 2 inches thick. The subsoil is dark yellowish brown silty clay loam 6 inches thick. The upper 3 inches of the substratum is dark yellowish brown silty clay loam, the next 6 inches is very dark grayish brown silty clay, and the lower part to a depth of 35 inches is very pale brown silty clay. Highly weathered shale is at a depth of 35 inches. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of the Blueflat soil is slow. Available water capacity is 2.5 to 6.0 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Organic matter content in the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The Neiber soil is moderately deep and well drained. It formed in alluvium and residuum derived from sandstone and interbedded shale. Slopes range from 2 to 15 percent but are commonly less than 10 percent. The present vegetation in most areas is galleta, Indian ricegrass, and shadscale. Typically, the surface layer is light yellowish brown silt loam 3 inches thick. The subsoil is light yellowish brown and pale brown silty clay loam about 9 inches thick. The substratum to a depth of 32 inches is light gray and white silty clay loam. Hard shale is at a depth of 32 inches. Depth to hard shale or sandstone is 20 to 40 inches.

Permeability of the Neiber soil is moderately slow. Available water capacity is 3 to 7 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Blueflat soil is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush. The potential plant community on the Neiber soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical revegetate large areas of this unit because of the low annual precipitation and the low water supplying capacity of the soils. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Blueflat soil is in Desert Clay range site, and the Neiber soil is in Desert Loam range site.

9—Bookcliff-Shalako complex. This map unit is on old landslides on mountainsides and ridges throughout the Book Cliffs, east of the mouth of Floy Canyon. Slope is 3 to 30 percent. Elevation is 6,400 to 7,800 feet. The average annual precipitation is 14 to 19 inches, the mean annual air temperature is 40 to 47 degrees F, and the average freeze-free season is 60 to 90 days.

This unit is 40 percent Bookcliff sandy loam in concave areas of side slopes and 30 percent Shalako very stony fine sandy loam on ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 10 percent deep, clayey soils on foot slopes; 10 percent shallow, loamy soils that are more than 35 percent rock fragments and are on ridges; 5 percent deep, loamy soils that are more than 35 percent rock fragments, support the same type of vegetation as the Shalako soil, and are on steep side slopes; and 5 percent deep, loamy soils that are on steep, north-facing side slopes and support Douglas-fir.

The Bookcliff soil is deep and well drained. They formed in colluvium and alluvium derived dominantly from sandstone and shale. Slopes are concave, are less than 100 feet long, and generally face north and west. The present vegetation in most areas is Gambel oak, snowberry, and Salina wildrye. Typically, the surface is covered with a layer of partially decomposed needles, leaves, and twigs about 1 inch thick. The surface layer is brown sandy loam 4 inches thick. The subsoil is brown loam 8 inches thick. The upper 20 inches of the substratum is yellowish brown loam, and the lower part to a depth of 51 inches is pale brown channery clay loam. Sandstone is at a depth of 51 inches. Depth to sandstone ranges from 40 to 60 inches or more.

Permeability of the Bookcliff soil is moderately slow. Available water capacity is 6 to 11 inches. Water supplying capacity is 8 to 14 inches. Effective rooting depth is 40 to 60 inches or more. The organic matter content of the surface layer is 3 to 5 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Shalako soil is shallow and well drained. It formed in residuum and alluvium derived from sandstone. Slopes are convex and are less than 50 feet long. The present vegetation in most areas is birchleaf mountainmahogany, pinyon, and Utah juniper. Typically, 80 percent of the surface is covered with rock fragments, including 40 percent pebbles, 20 percent cobbles, and 20 percent

stones. The surface layer is brown very stony fine sandy loam about 3 inches thick. The upper 4 inches of the underlying material is brown sandy loam, and the lower 10 inches is brown cobbly loam. Sandstone is at a depth of 17 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Shalako soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The potential plant community on the Bookcliff soil is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are Columbia needlegrass, mountain brome, Gambel oak, and Utah serviceberry. The potential plant community on the Shalako soil is an overstory of pinyon and Utah juniper with a canopy of 60 percent. The understory vegetation is 15 percent grasses, 10 percent forbs, and 75 percent shrubs. Important plants are pinyon, Utah juniper, birchleaf mountainmahogany, and Mexican cliffrose.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. In areas where the desirable forage plants are depleted, brush management and seeding can be used to improve the vegetation. Suitable brush management practices include prescribed burning and chemical and mechanical treatment. Eradication of Gambel oak is difficult; therefore, a combination of brush management practices may be necessary. Gambel oak will reoccupy the area in time.

The suitability of this unit for rangeland seeding is fair. The main limitations are plant competition, the shallow depth of the Shalako soil, and steepness of slope. Plants suitable for seeding include adapted native plants and smooth brome, orchardgrass, intermediate wheatgrass, and alfalfa.

The site index for pinyon and Utah juniper on the Shalako soil is 32. Average yields are 4 cords of wood per acre per year. The potential is poor for post and Christmas tree production. Use of equipment in the steeper areas increases the risk of erosion.

This map unit is in capability subclass VIIe. The Bookcliff soil is in Mountain Loam (Oak) range site, and the Shalako soil is in Upland Shallow Loam (Pinyon-Utah juniper) range site.

10—Chipeta silty clay loam, 10 to 25 percent slopes. This very shallow, well drained soil is on plains and highly dissected pediments south of Book Cliffs. It formed in residuum and alluvium derived dominantly from weathered marine shale. Slopes are less than 25 feet long and mostly convex. The present vegetation in most areas is mat saltbush and some wedgeleaf saltbush, galleta, and Indian ricegrass. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 150 to 170 days.

Typically, the surface layer is light olive brown silty clay loam about 3 inches thick. The underlying material to a depth of 8 inches is light olive brown clay. Weathered shale is at a depth of 8 inches. Depth to weathered shale ranges from 5 to 10 inches.

Included in this unit about 15 percent Chipeta soils, thick; 5 percent moderately deep, silty soils at the base of slopes; and 5 percent Badland in the steeper areas.

Permeability of the Chipeta soil is slow. Available water capacity is less than 2 inches. Water supplying capacity is less than 2 inches. Effective rooting depth is 5 to 10 inches. Organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Chipeta soil is 15 percent grasses, 15 percent forbs, and 70 percent shrubs. Important plants are mat saltbush, galleta, deserttrumpet, and bud sagebrush.

This unit is limited for grazing because of the low production and relative unpalatability of the dominant plants.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and the very shallow soil depth. For critical erosion control, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are native plants and prostrate kochia.

This map unit is in capability subclass VIIs and in Desert Shallow Clay range site.

11—Chipeta complex. This map unit is on broad plains below the Book Cliffs, north and west of Arches National Park. Slope is 1 to 10 percent. Elevation is 4,500 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is 40 percent Chipeta silty clay loam that generally is in convex areas and on nose slopes and 30 percent Chipeta silty clay loam, thick, in smooth to concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent moderately deep, silty soils in concave areas; 10 percent silty,

shallow soils that support wedgeleaf saltbush, galleta, shadscale, and mat saltbush; and 10 percent very deep, silty soils that are in lower lying, concave areas and support wedgeleaf saltbush and galleta.

The Chipeta silty clay loam is very shallow and well drained. It formed in residuum and alluvium derived dominantly from marine shale. Slopes commonly are less than 50 feet long. The present vegetation in most areas is mat saltbush and some wedgeleaf saltbush, galleta, and Indian ricegrass. Typically, the surface layer is light brownish gray silty clay loam about 3 inches thick. The underlying material is light brownish gray silty clay loam 5 inches thick. Weathered shale is at a depth of 8 inches. Depth to weathered shale ranges from 5 to 10 inches.

Permeability of this Chipeta soil is slow. Available water capacity is less than 2 inches. Water supplying capacity is less than 2 inches. Effective rooting depth is 5 to 10 inches. Organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Chipeta silty clay loam, thick, is shallow and well drained. It formed in residuum and alluvium derived dominantly from marine shale. Slope generally is less than 5 percent. Slopes are less than 50 feet long. The present vegetation in most areas is galleta, wedgeleaf saltbush, mat saltbush, and bud sagebrush. Typically, the surface layer is light brownish gray silty clay loam about 2 inches thick. The upper 2 inches of the underlying material is light brownish gray silty clay loam, and the lower part to a depth of 18 inches is light gray silty clay. Weathered shale is at a depth of 18 inches. Depth to weathered shale ranges from 10 to 20 inches.

Permeability of this Chipeta soil is slow. Available water capacity is less than 3.5 inches. Water supplying capacity is less than 2.5 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Chipeta silty clay loam is 15 percent grasses, 15 percent forbs, and 70 percent shrubs. Important plants are mat saltbush, galleta, deserttrumpet, and bud sagebrush. The potential plant community on the Chipeta silty clay loam, thick, is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

This unit is limited for grazing because of the low production and relative unpalatability of the dominant plants.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and low water supplying capacity of the soils. Revegetation with species grown for nursery stock and transplanted may be successful on this unit. Contour plowing of disturbed areas reduces runoff and erosion and allows snowmelt to collect in the furrows. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Chipeta silty clay loam is in Desert Shallow Clay range site, and the Chipeta silty clay loam, thick, is in Desert Clay range site.

12—Chipeta-Badland complex. This map unit is on back slope escarpments of fan pediments below Book Cliffs and on highly dissected pediments and hills. Slope is 25 to 50 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is 40 percent Chipeta silty clay loam, 25 to 50 percent slopes, and 20 percent Badland. The Chipeta soil is scattered throughout the unit, and it supports sparse vegetation, mostly mat saltbush. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent Chipeta soils that have slopes of less than 25 percent; 15 percent shallow, clayey soils; and 10 percent moderately deep, silty soils that support wedgeleaf saltbush, mat saltbush, and galleta and are at the base of slopes.

The Chipeta soil is very shallow and well drained. It formed in alluvium and residuum derived dominantly from marine shale. Slopes are generally convex and less than 20 feet long. The present vegetation in most areas is mat saltbush with some wedgeleaf saltbush, galleta, and Indian ricegrass. Typically, the surface layer is olive brown silty clay loam 3 inches thick. The underlying material to a depth of 8 inches is light brownish gray silty clay. Weathered shale is at a depth of 8 inches. Depth to weathered shale ranges from 5 to 10 inches.

Permeability of the Chipeta soil is slow. Available water capacity is less than 2 inches. Water supplying capacity is less than 2 inches. Effective rooting depth is 5 to 10 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

Badland consists of steep to very steep barren areas of actively eroding shale and shale interbedded with gypsum and thin layers of sandstone. The areas of

Badland are highly dissected by drainageways and are characterized by angular ridges and nose slopes.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Chipeta soil is 15 percent grasses, 15 percent forbs, and 70 percent shrubs. Important plants are mat saltbush, galleta, deserttrumpet, and bud sagebrush.

This soil is limited for grazing because of the low production and relative unpalatability of the dominant plants. Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments.

It is not practical to revegetate large areas of this unit because of the low annual precipitation, steepness of slope, and very shallow soil depth. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Chipeta soil is in Desert Shallow Clay range site.

13—Dast family, 50 to 80 percent slopes. This map unit consists of moderately deep and deep, well drained soils on canyonsides and mountainsides. These soils are throughout the Book Cliffs area. They formed in colluvium and residuum derived from sandstone and shale. Slopes are convex and are 50 to 100 feet long. The present vegetation in most areas is pinyon, Utah juniper, Utah serviceberry, and birchleaf mountainmahogany. Elevation is 5,200 to 7,700 feet. The average annual precipitation is 12 to 16 inches, the mean annual air temperature is 41 to 45 degrees F, and the average freeze-free period is 70 to 120 days.

No single profile of Dast family soils is typical, but one commonly observed in the survey area has a mantle of partially decomposed leaves, twigs, and needles 0.5 inch thick. About 21 percent of the surface is covered with rock fragments, of which 5 percent is channery fragments, 10 percent is pebbles, 4 percent is stones, and 2 percent is boulders. The surface layer is brown bouldery sandy loam 5 inches thick. The next layer is brown fine sandy loam 11 inches thick. The underlying material to a depth of 34 inches is pale brown channery loam and loam. Sandstone is at a depth of 34 inches. Depth to sandstone ranges from 20 to 60 inches.

Included in this unit are 15 percent shallow soils adjacent to sandstone ledges and benches, 10 percent very deep, loamy soils in drainageways, and 5 percent Rock outcrop occurring as sandstone ledges.

Permeability of this Dast family soil is moderately rapid. Available water capacity is about 3 to 5 inches. Water supplying capacity is 2 to 6 inches. Effective rooting depth is 20 to 60 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used for wildlife habitat and woodland.

The potential vegetation on this unit is an overstory of pinyon and Utah juniper with a canopy of 20 percent. The understory vegetation is 25 percent grasses, 15 percent forbs, and 60 percent shrubs. Important plants are Salina wildrye, beardless wheatgrass, birchleaf mountainmahogany, snowberry, and Utah serviceberry.

This unit is not grazeable by livestock because of the steepness of slope.

The site index for pinyon and Utah juniper on this unit is 44. Average yields are 6 cords of wood per acre. The potential is fair for post or Christmas tree production. Because of the steepness of slope, it is extremely difficult to harvest the wood on this unit.

This map unit is in capability subclass VIIe and in Upland Very Steep Loam (Pinyon-Utah Juniper) range site.

14—Dune land-Aneth family complex. This map unit is on valley fills along valley floors. It is along White Wash, near the Green River. Slope is 2 to 10 percent. Elevation is 4,100 to 4,400 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit is about 50 percent Dune land and 30 percent Aneth family soils. The Dune land is on valley sides and valley floors, and the Aneth family soils are between dunes on valley fills. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent shallow, sandy soils that support blackbrush and galleta, 5 percent very deep, loamy soils along drainageways, 5 percent sandy and gravelly sediment that is reworked by streams so frequently that it supports little if any vegetation, and 5 percent Rock outcrop.

Dune land is characterized by mounds of sand that are 4 to 20 feet in height and 10 to 200 feet in diameter. It supports little if any vegetation.

The Aneth family soils are very deep and well drained. They formed in alluvium and in eolian material derived dominantly from sandstone. Slope ranges from 2 to 10 percent but is commonly less than 5 percent. Slopes commonly are 100 to 300 feet long. The present vegetation in most areas is sand sagebrush, eriogonum, sand dropseed, sandhill muhly, and annuals. Some areas that receive additional moisture from runoff support cottonwood, greasewood, and saltcedar. Vegetation generally is sparse. No single profile is typical of the Aneth family soils, but one commonly observed in the survey area has a thin mantle of pebbles on the surface. The surface layer is reddish yellow loamy fine sand about 4 inches thick. The next layer is yellowish red loamy sand 8 inches thick. Below this to a depth of 60

inches or more is light brown loamy sand and fine sandy loam.

Permeability of this Aneth family soil is rapid. Available water capacity is 3.0 to 5.5 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is more than 60 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Aneth family soils is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are Indian ricegrass, galleta, dropseed, and fourwing saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and the hazard of soil blowing. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants.

This map unit is in capability subclass VIIs. The Aneth family soils are in Desert Sand range site.

15—Factory-Pastern fine sandy loams. This map unit is on pediments and structural benches north of Bartlett Flat, south of the Needles and near Dubinky Well. Slope is 2 to 10 percent. Elevation is 5,000 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 140 to 160 days.

This unit is 40 percent Factory fine sandy loam and 25 percent Pastern fine sandy loam. The Factory soil is in concave areas on the lower slopes, and the Pastern soil is in convex areas and on the rims of benches. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent deep, loamy soils in concave areas along drainageways, 10 percent shallow soils that are on the sides of benches and support Utah juniper, 10 percent very deep soils that have a strong accumulation of calcium carbonate and are intermingled with the Factory soil and support the same kinds of vegetation, and 5 percent Rock outcrop below the benches.

The Factory soil is moderately deep and well drained. It formed in alluvium with a mantle of eolian material derived dominantly from sandstone and conglomerate. Slopes are 50 to 100 feet long. The present vegetation in most areas is galleta, Indian ricegrass, Mormon-tea, and fourwing saltbush. Typically, the surface layer is reddish brown fine sandy loam about 4 inches thick. The upper 11 inches of the subsoil is yellowish red fine sandy loam, and the lower 7 inches is light reddish brown fine sandy loam. The substratum is pink gravelly fine sandy loam about 12 inches thick over an indurated hardpan. Below the hardpan to a depth of 60 inches or more is pinkish white fine sandy loam. Depth to the hardpan ranges from 20 to 40 inches.

Permeability of the Factory soil is moderately rapid. Available water capacity is 2.0 to 5.5 inches. Water supplying capacity is 2.0 to 5.5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is about 1 percent. Runoff is slow to medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Pastern soil is very shallow and shallow and is well drained. It formed in alluvium with a mantle of eolian material derived dominantly from sandstone and conglomerate. Slopes are generally less than 50 feet long. The present vegetation in most areas is blackbrush, Mormon-tea, galleta, and Indian ricegrass. Typically, 35 percent of the surface is covered with pebble-sized channery fragments of sandstone or chert. The surface layer is reddish brown fine sandy loam about 1 inch thick. The subsoil is yellowish red fine sandy loam about 12 inches thick. The substratum is pink gravelly fine sandy loam about 5 inches thick over an indurated hardpan. Depth to the hardpan ranges from 7 to 20 inches.

Permeability of the Pastern soil is moderate. Available water capacity is less than 3 inches. Water supplying capacity is 1.5 to 3.5 inches. Effective rooting depth is 7 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on Factory soil is 60 percent grasses, 15 percent forbs, and 25 percent shrubs. Important plants are needleandthread, Indian ricegrass, and fourwing saltbush. The potential plant community on the Pastern soil is 15 percent grasses, 10 percent forbs, and 75 percent shrubs. Important plants are blackbrush, blue grama, galleta, and Mormon-tea.

Management practices that maintain or improve the rangeland vegetation on this unit include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

It is not practical to revegetate large areas of this unit because of the restricted soil depth and low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants suitable for seeding in these areas

include adapted native plants, crested wheatgrass, and ladak alfalfa.

This map unit is in capability subclass VIIs. The Factory soil is in Semidesert Sandy Loam range site, and the Pastern soil is in Semidesert shallow Sandy Loam (Blackbrush) range site.

16—Firth-Plite families association. This map unit is on valley floors and stream terraces in the upper drainageways of the Book Cliffs. Slope is 0 to 8 percent. Slopes are concave and less than 50 feet long. Elevation is 6,700 to 8,000 feet. The average annual precipitation is 14 to 20 inches, the mean annual air temperature is 39 to 43 degrees F, and the average freeze-free season is 30 to 70 days.

This unit is about 60 percent Firth family soils, 0 to 3 percent slopes, on stream bottoms and flood plains and 20 percent Plite family soils, 1 to 8 percent slopes, on stream terraces.

Included in this unit are 5 percent very deep, loamy soils that are along stream channels and support basin big sagebrush; 5 percent very deep, dark colored soils that are on steep cutbanks below stream terraces and support Gambel oak and basin big sagebrush; 5 percent very deep, dark colored soils that have a seasonal high water table at or near the surface, are intermingled with areas of the Firth family soils, and support Gambel oak, Woods rose, narrowleaf cottonwood, and common dandelion; and 5 percent unstabilized sandy or gravelly sediment that is reworked by streams so frequently that it supports little if any vegetation. The percentage varies from one area to another.

The Firth family soils are very deep and are poorly drained and somewhat poorly drained. They formed in alluvium derived dominantly from sandstone and shale. The present vegetation in most areas is Gambel oak, Woods rose, narrowleaf cottonwood, and common dandelion. No single profile of the Firth family soils is typical, but one commonly observed in the survey area has a surface layer of dark grayish brown and dark brown sandy loam 14 inches thick. The subsoil is olive gray loam 9 inches thick. The upper 22 inches of the substratum is olive sandy loam, and the lower part to a depth of 60 inches or more is dark gray clay loam.

Permeability of this Firth family soil is moderate. Available water capacity is about 6 to 10 inches. Effective rooting depth is mostly concentrated above the water table, but some roots may extend to a depth of more than 60 inches. A water table is at a depth of 1 to 3 feet from October to August. The soils are frequently flooded from March to May. The organic matter content of the surface layer is 5 to 10 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Plite family soils are very deep and well drained. They formed in mixed alluvium derived from sandstone and shale. Slopes are convex or concave and are less than 50 feet long. The present vegetation in most areas is Gambel oak and basin big sagebrush. No single profile of the Plite family soils is typical, but one commonly observed in the survey area has a 2-inch-thick layer of partially decomposed leaves and twigs on the surface. The surface layer is dark brown and brown sandy loam 12 inches thick. The subsoil is dark brown loam 8 inches thick. The upper 22 inches of the substratum is brown sandy loam, and the lower part to a depth of 60 inches or more is dark brown loam.

Permeability of this Plite family soil is moderately rapid. Available water capacity is about 6 to 9 inches. Water supplying capacity is 9 to 14 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is more than 5 percent. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Firth family soils is riparian vegetation with a variable overstory of trees and shrubs. Important plants are narrowleaf cottonwood, willow, bearded wheatgrass, mountain brome, slender wheatgrass, and western wheatgrass. The potential plant community on the Plite family soils is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are Columbia needlegrass, mountain brome, Gambel oak, and Utah serviceberry.

Practices needed to maintain or improve the vegetation on this unit include proper grazing use and planned grazing systems. Because of the ecological importance of the riparian vegetation, mechanical or chemical treatment should not be used. Proper management is very important.

The suitability of this unit for rangeland seeding is good. The main limitation is plant competition. Plants suitable for seeding include adapted native plants and smooth brome, orchardgrass, intermediate wheatgrass, and alfalfa.

This map unit is in capability subclass VIIw. The Firth family soils are in Semiwet Fresh Streambank range site, and the Plite family soils are in Mountain Loam (Oak) range site.

17—Flatnose sandy loam, 1 to 8 percent slopes. This very deep, well drained soil is on narrow fluvial plains and valley bottoms of the major drainageways throughout the Book Cliffs. The soil formed in alluvium derived dominantly from sandstone. Slopes are concave and less than 100 feet long. The present vegetation in most areas is basin big sagebrush, Salina wildrye, and Indian ricegrass. In some areas at higher elevations, Gambel oak is in drainageways. Elevation is 5,600 to 7,200 feet. The average annual precipitation is 12 to 16 inches, the mean annual air temperature is 45 to 47 degrees F, and the average freeze-free season is 70 to 100 days.

Typically, the surface layer is brown sandy loam 4 inches thick. Below this to a depth of 60 inches or more is stratified, light yellowish brown to brown sandy fine loam and gravelly sandy loam.

Included in this unit are 5 percent very deep, poorly drained, loamy soils that have a dark colored surface layer more than 16 inches thick, are at the higher elevations of the unit, and support quaking aspen, cottonwood, and Woods rose; 5 percent very deep, loamy soils that are at the lower elevations of the unit and support greasewood; 5 percent unstabilized sandy and gravelly sediment that is reworked by streams so frequently that it supports little if any vegetation; 5 percent very deep, dark colored, loamy soils that are on terraces and support Gambel oak; and 5 percent shallow, loamy soils that support pinyon and Utah juniper and are on ledges and benches at the edge of valley floors.

Permeability of the Flatnose soil is moderately rapid. Available water capacity is 6.5 to 7.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 3 to 5 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to brief periods of flash flooding in July through September and January through March.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Flatnose soil is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are basin wildrye, western wheatgrass, basin big sagebrush, and rubber rabbitbrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. If the desirable forage plants are depleted, brush management and rangeland seeding can be used to improve the rangeland vegetation. Suitable brush management practices include prescribed burning or chemical or mechanical treatment.

The suitability of this unit for rangeland seeding is good. Plants suitable for seeding include the native species in the potential plant community and Russian wildrye, crested wheatgrass, and ladak alfalfa.

This map unit is in capability subclass VIc and in Loamy Bottom range site.

18—Hanksville family-Badland complex. This map unit is on back slopes of mesas and cuestas and on the face of the Book Cliffs. Slope is 30 to 50 percent. Slopes generally face south. Elevation is 4,200 to 6,100 feet. The average annual precipitation is 6 to 8 inches, the mean annual air temperature is 47 to 54 degrees F, and the average freeze-free season is 120 to 170 days.

This unit is 40 percent Hanksville family soils, 30 to 50 percent slopes, and 35 percent Badland. The Hanksville family soils are on side slopes and colluvial fans, and the areas of Badland are on back slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent shallow, clayey soils on steeper side slopes; 5 percent Rock outcrop that occurs as escarpments, cliffs, and ledges; 5 percent moderately deep, loamy soils that are on north- and west-facing side slopes and support Salina wildrye; 3 percent Rubble land consisting of talus material that has accumulated below the areas of Rock outcrop; and 2 percent very deep, loamy soils in drainageways at the base of slopes.

The Hanksville family soils are well drained and are moderately deep to shale. They formed in colluvium and residuum derived dominantly from shale. Slopes are convex and are less than 20 feet long. The present vegetation in most areas is mat saltbush, galleta, wedgeleaf saltbush, and scattered shadscale. Vegetation commonly is sparse.

No single profile of the Hanksville family soils is typical, but in one commonly observed in the survey area 7 percent of the surface is covered with boulders, 30 percent with pebbles, and 10 with percent channery fragments. The surface layer is light yellowish brown extremely bouldery silt loam 3 inches thick. The next layer is light yellowish brown silty clay loam 6 inches thick. The underlying material to a depth of 35 inches is olive brown and dark gray silty clay loam and silty clay. Weathered shale is at a depth of 35 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of this Hanksville family soil is slow. Available water capacity is 3 to 7 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

Badland consists of steep to very steep, barren areas of actively eroding shale and shale interbedded with gypsum and thin layers of sandstone. The areas of Badland are highly dissected by drainageways and are characterized by angular ridges and nose slopes.

This unit is used for wildlife habitat.

The potential plant community on the Hanksville family soils is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation, steepness of slope, and low water supplying capacity of the soil. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants

that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Hanksville family soils are in Desert Clay range site.

19—Hanksville family-Shalet complex. This map unit is on structural benches that have been highly dissected by drainageways. It is south of Salt Wash, near the Green River, and east of Arches National Park, in Moab Canyon. Slope is 3 to 50 percent. Elevation is 4,200 to 4,900 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 150 to 180 days.

This unit is about 50 percent Hanksville family soils, 30 to 50 percent slopes, on side slopes, escarpments, and nose slopes, and 30 percent Shalet loam, 3 to 10 percent slopes, on remnants of benches. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent very deep, loamy soils that are on benches and support fourwing saltbush and Indian ricegrass, 5 percent very deep, loamy soils that are along drainageways and support greasewood, and 5 percent very deep, sandy soils that are in concave areas and support sand sagebrush.

The Hanksville family soils are moderately deep and well drained. These soils formed in residuum and colluvium derived dominantly from shale. Slopes are generally convex and less than 50 feet long. The present vegetation in most areas is mat saltbush, wedgeleaf saltbush, galleta, and bud sagebrush. In some areas shadscale occurs with wedgeleaf saltbush on south-facing side slopes.

No single profile is typical of the Hanksville family soils, but one commonly observed in the survey area has a reddish brown flaggy loam surface layer about 3 inches thick. The next layer is reddish brown clay loam about 9 inches thick. The underlying material to a depth of 27 inches is reddish brown clay. Weathered shale is at a depth of 27 inches. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of this Hanksville family soil is slow. Available water capacity is 3 to 7 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

The Shalet soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from shale and soft sandstone. Slopes are generally convex and less than 50 feet long. The present vegetation in most areas is galleta, shadscale, Indian ricegrass, and Mormon-tea. Blackbrush is in some areas at higher elevations. Typically, the surface layer is reddish brown loam 3 inches thick. The underlying material to a depth of 7 inches is reddish brown clay loam. Shale or soft sandstone is at a depth of 7 inches. Depth to shale and soft sandstone ranges from 5 to 20 inches.

Permeability of the Shalet soil is moderately slow. Available water capacity is less than 3.5 inches. Water supplying capacity is less than 2.5 inches. Effective rooting depth is 5 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, recreation areas, and wildlife habitat.

The potential plant community on the Hanksville family soils is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

The potential plant community on the Shalet soil is 35 percent grasses, 15 percent forbs, and 50 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and wedgeleaf saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the restricted soil depth, low water supplying capacity of the soils, and low annual precipitation. For critical erosion control, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Hanksville family soils are in Desert Clay range site, and the Shalet soil is in Desert Shallow Loam (Shadscale) range site.

20—Hostage-Barx complex. This map unit is on alluvial fans east of Horse Canyon, along the base of the Book Cliffs. Slope is 1 to 15 percent. Elevation is 5,000 to 6,000 feet. The average annual precipitation is 7 to 12 inches, the mean annual air temperature is 47 to 51 degrees F, and the average freeze-free season is 110 to 150 days.

This unit is 40 percent Hostage gravelly fine sandy loam, 3 to 15 percent slopes, on convex side slopes and the upper part of alluvial fans and 25 percent Barx fine sandy loam, 1 to 5 percent slopes, on slightly concave to smooth side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 5 percent very deep, loamy, sodium-affected soils in depressional areas; 5 percent moderately deep, silty soils and 5 percent shallow, clayey soils that are on the dissected, steeper, south-

facing side slopes and support wedgeleaf saltbush and mat saltbush; 5 percent moderately deep, loamy soils that are on the steeper upper edges of alluvial fans and support Salina wildrye; 5 percent Badland in dissected areas and on the upper edges of alluvial fans; 5 percent very deep, stony soils that are in some drainageways and support Utah juniper; and 5 percent very deep, loamy soils that are along drainageways and support basin big sagebrush.

The Hostage soil is deep and well drained. It formed in alluvium over residuum derived dominantly from shale and sandstone. Slopes are less than 50 feet long, and they face south or east. The present vegetation in most areas is galleta, Indian ricegrass, and shadscale. Typically, the surface layer is light yellowish brown gravelly fine sandy loam 3 inches thick. The upper 21 inches of the underlying material is yellowish brown and light yellowish brown gravelly loam, the next 8 inches is grayish brown gravelly clay loam, and the lower part to a depth of 42 inches is grayish brown silty clay. Weathered shale is at a depth of 42 inches. Depth to weathered shale ranges from 40 to 60 inches.

Permeability of this Hostage soil is moderately slow. Available water capacity is 4.5 to 8.5 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 40 to 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Barx soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone. Slopes are less than 50 feet long, and they face south or east. The present vegetation in most areas is Wyoming big sagebrush, fourwing saltbush, and spiny hopsage. Typically, the surface layer is brown fine sandy loam 2 inches thick. The upper 11 inches of the subsoil is brown and yellowish red clay loam, the next 9 inches is yellowish red loam, and the lower part to a depth of 33 inches is pink sandy clay loam. The substratum to a depth of 60 inches or more is white sandy loam.

Permeability of the Barx soil is moderate. Available water capacity is 8.0 to 10.5 inches. Water supplying capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Hostage soils is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

The potential plant community on the Barx soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Indian ricegrass, galleta, Wyoming big sagebrush, and winterfat. If a large percentage of the potential plant community is removed, Utah juniper and pinyon may invade.

Management practices that maintain or improve the vegetation on this unit include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

The suitability of this unit for rangeland seeding is poor because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and crested wheatgrass, ladak alfalfa, and prostrate kochia.

This map unit is in capability subclass VIIe. The Hostage soil is in Desert Loam range site, and the Barx soil is in Semidesert Loam (Wyoming Big Sagebrush) range site.

21—Hostage-Chipeta complex. This map unit is on alluvial fans and highly dissected shale pediments below the Book Cliffs, near Tusher and Horse Canyons. Slope is 1 to 15 percent. Elevation is 4,500 to 6,000 feet. The average annual precipitation is 6 to 8 inches, the mean annual air temperature is 48 to 51 degrees F, and the average freeze-free season is 140 to 160 days.

This unit is 40 percent Hostage gravelly fine sandy loam, 3 to 15 percent slopes, and 35 percent Chipeta silty clay loam, 1 to 10 percent slopes. The Hostage soil is on alluvial fans, and the Chipeta soil is on toe slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 5 percent shallow, loamy soils that are near dissected drainageways and ledges and support blackbrush; 5 percent Chipeta soils that are on the dissected, steeper side slopes and support mat saltbush; 5 percent Badland; 5 percent very deep, loamy soils that are on higher benches and support Wyoming big sagebrush and spiny hopsage; and 5 percent shallow, loamy soils that are on ledges and support Utah juniper and shadscale.

The Hostage soil is deep and well drained. It formed in alluvium over residuum derived dominantly from shale and sandstone. Slopes are less than 50 feet long, and they face south or east. The present vegetation in most areas is shadscale, green rabbitbrush, galleta, and scarlet globemallow. Typically, the surface layer is light yellowish brown gravelly fine sandy loam 3 inches thick. The upper 21 inches of the underlying material is yellowish brown and light yellowish brown gravelly loam, the next 8 inches is grayish brown gravelly clay loam, and the lower part to a depth of 42 inches is grayish brown silty clay. Weathered shale is at a depth of 42 inches. Depth to weathered shale ranges from 40 to 60 inches or more.

Permeability of this Hostage soil is moderately slow. Available water capacity is 4.5 to 11.0 inches. Water

supplying capacity is 3 to 5 inches. Effective rooting depth is 40 to 60 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Chipeta soil is very shallow and well drained. It formed in residuum and alluvium derived dominantly from marine shale. Slopes commonly are less than 25 feet long. The present vegetation in most areas is galleta, wedgeleaf saltbush, and mat saltbush. Typically, the surface layer is light brownish gray silty clay loam about 3 inches thick. The underlying material to a depth of 8 inches is light brownish gray silty clay loam. Weathered shale is at a depth of 8 inches. Depth to weathered shale ranges from 5 to 10 inches.

Permeability of the Chipeta soil is slow. Available water capacity is less than 2 inches. Water supplying capacity is less than 2 inches. Effective rooting depth is 5 to 10 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Hostage soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

The potential plant community on the Chipeta soil is 15 percent grasses, 15 percent forbs, and 70 percent shrubs. Important plants are mat saltbush, galleta, deserttrumpet, and bud sagebrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Hostage soil is in Desert Loam range site, and the Chipeta soil is in Desert Shallow Clay range site.

22—Hub family, 50 to 80 percent slopes. These deep and very deep, well drained soils are on mountainsides throughout the northern part of the Book Cliffs area. They formed in colluvium and residuum derived from interbedded sandstone and shale. Slopes are convex and are commonly 100 to 300 feet long. The present vegetation in most areas is Douglas-fir, snowberry, mountainlover, and creeping barberry. Elevation is 7,000 to 9,100 feet. The average annual precipitation is 20 to 25 inches, the mean annual air temperature is 34 to 40 degrees F, and the average freeze-free season is 20 to 60 days.

No single profile of the Hub family soils is typical, but one commonly observed in the survey area has a 3-inch-thick organic layer on the surface. About 5 percent of the surface is covered with stones, and 1 percent is covered with boulders. The surface layer is dark brown very stony sandy loam 6 inches thick. The subsurface layer is brown stony sandy loam 8 inches thick. The upper 7 inches of the subsoil is brown stony sandy loam, and the lower 10 inches is brown gravelly sandy clay loam. The substratum to a depth of 60 inches or more is strong brown cobbly sandy loam.

Included in this unit are 10 percent deep, dark colored, loamy soils that are along some drainageways and support Gambel oak; 10 percent moderately deep, dark colored, loamy soils that are throughout the unit and support Douglas-fir; and 5 percent shallow, loamy soils that are near ledges and support pinyon and Utah juniper.

Permeability of this Hub family soil is moderate. Available water capacity is 4 to 9 inches. Water supplying capacity is 8 to 18 inches. Effective rooting depth is 40 inches or more. The organic matter content of the surface layer is more than 5 percent. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as woodland and wildlife habitat.

The potential plant community consists of Douglas-fir with a canopy cover of 90 percent. The understory vegetation is 10 percent grasses, 5 percent forbs, and 85 percent shrubs. Important plants are sedges, penstemon, mountainlover, snowberry, and currant.

This unit is limited for livestock grazing because of the steepness of slope and limited forage production. The main limitation for seeding is steepness of slope.

The site index for Douglas-fir on this unit is 50. Average yield is about 27,200 board feet per acre for trees 12 inches or more in diameter at 100 years of age. The main limitations for harvesting wood products are steepness of slope and the risk of erosion after trees are removed.

This map unit is in capability subclass VIIe and in High Mountain Very Steep Loam (Douglas-fir) range site.

23—Killpack silt loam, 1 to 10 percent slopes. This moderately deep, well drained soil is on pediments and plains, mainly in concave areas. The soil is below the Book Cliffs and generally north of Interstate 70. It formed in alluvium and residuum derived dominantly from marine shale. Slope ranges from 1 to 10 percent but is commonly less than 5 percent. Slopes are smooth to concave and 50 to 100 feet long. The present vegetation in most areas is wedgeleaf saltbush, winterfat, galleta, and Indian ricegrass. Elevation is 4,500 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the

mean annual air temperature is 50 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

Typically, the surface layer is pale brown silt loam about 4 inches thick. The upper 10 inches of the underlying material is pale brown silty clay loam, the next 9 inches is light brownish gray silty clay loam, and the lower part to a depth of 38 inches is grayish brown silty clay loam. Weathered gypsiferous shale is at a depth of 38 inches. Depth to weathered shale ranges from 20 to 40 inches.

Included in this unit are about 15 percent soils that are similar to this Killpack soil but are in steeper areas on the upper part of fans and the sides of pediments; 5 percent very deep, loamy soils that are along drainageways and support greasewood; 5 percent shallow, clayey soils intermingled with areas of the Killpack soil; and 5 percent moderately deep, loamy soils that are on dissected remnants of alluvial fan pediments and support shadscale.

Permeability of the Killpack soil is moderately slow. Available water capacity is 4.5 to 7.0 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, recreation, and wildlife habitat.

The potential plant community on the Killpack soil is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and low water supplying capacity of the soil. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe and in Desert Clay range site.

24—Killpack-Chipeta complex. This map unit is on highly dissected pediments and hills in the east-central part of the survey area, northeast of Cisco. Slope is 10 to 25 percent. Elevation is 4,500 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 50 to 55 degrees F, and the average freeze-free season is 140 to 170 days.

This unit is 40 percent Killpack silty clay loam and 25 percent Chipeta silty clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent very deep, silty soils along drainageways, 10 percent moderately deep, loamy soils on north aspects of hills, 5 percent shallow soils that are at the base of slopes and support Salina wildrye and shadscale, 5 percent Killpack soils that have slopes of less than 10 percent and are on foot slopes, and 5 percent Badland.

The Killpack soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from marine shale. Slopes are smooth to convex and less than 25 feet long. The present vegetation in most areas is wedgeleaf saltbush, galleta, and some mat saltbush. Typically, the surface layer is very pale brown silty clay loam 4 inches thick. The upper 12 inches of the underlying material is pale brown silty clay loam, the next 7 inches is pale brown silt loam, and the lower part to a depth of 36 inches is very pale brown silty clay loam. Gypsiferous shale is at a depth of 36 inches. Depth to partially weathered shale ranges from 20 to 40 inches.

Permeability of the Killpack soil is moderately slow. Available water capacity is 4.5 to 7.0 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

The Chipeta soil is very shallow and well drained. It formed in residuum derived dominantly from marine shale. Slopes are convex and less than 25 feet long. The present vegetation in most areas is mat saltbush, galleta, and some wedgeleaf saltbush. Typically, the surface layer is light olive brown silty clay loam 3 inches thick. The underlying material to a depth of 8 inches is light olive brown silty clay. Weathered shale is at a depth of 8 inches. Depth to weathered shale ranges from 5 to 10 inches.

Permeability of the Chipeta soil is slow. Available water capacity is less than 2 inches. Water supplying capacity is less than 2 inches. Effective rooting depth is 5 to 10 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Killpack soil is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

The potential plant community on the Chipeta soil is 15 percent grasses, 15 percent forbs, and 70 percent shrubs. Important plants are mat saltbush, galleta, deserttrumpet, and bud sagebrush.

This unit is limited for livestock grazing because of the low production and relative unpalatability of the dominant plants.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

It is not practical to revegetate large areas of this unit because of the steepness of slope, low annual precipitation, low water supplying capacity of the soils, and restricted soil depth. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are native plants and prostrate kochia.

This map unit is in capability subclass VIIe. The Killpack soil is in Desert Clay range site, and the Chipeta soil is in Desert Shallow clay range site.

25—Killpack-Blueflat complex. This map unit is on uplifted parts of pediments in the east-central part of the survey area, south of Book Cliffs and north of the Colorado River. Slope ranges from 1 to 25 percent but is generally less than 10 percent. Slopes are convex or concave and are generally less than 50 feet long. The present vegetation in most areas is wedgeleaf saltbush, galleta, Indian ricegrass, and some shadscale. Elevation is 4,500 to 4,900 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 50 to 55 degrees F, and the average freeze-free season is 150 to 170 days.

This unit is about 40 percent Killpack silt loam, 1 to 10 percent slopes, and 25 percent Blueflat loam, 2 to 25 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent moderately deep, loamy soils that support galleta, Indian ricegrass, and shadscale and are in nearly level areas on upper pediments; 10 percent moderately deep, loamy soils that are on steep, north-facing side slopes and support Salina wildrye and shadscale; 5 percent very deep, sodium-affected soils in drainageways; 5 percent very shallow, clayey soils that are on slope breaks and support mat saltbush; and 5 percent very deep, silty soils in concave areas.

The Killpack soil is moderately deep and well drained. It formed in alluvium and residuum derived from marine shale. Typically, the surface layer is pale brown silt loam 4 inches thick. The upper 10 inches of the underlying material is pale brown silty clay loam, the next 9 inches is light brownish gray silty clay loam, and the lower part to a depth of 38 inches is grayish brown silty clay loam. Weathered gypsiferous shale is at a depth of 38 inches. Depth to a weathered shale ranges from 20 to 40 inches.

Permeability of the Killpack soil is moderately slow. Available water capacity is 4.5 to 7.0 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Blueflat soil is moderately deep and well drained. It formed in residuum derived from marine shale. Typically, 10 percent of the surface is covered with pebble-sized channery fragments of sandstone, siltstone, or hard shale. The surface layer is light yellowish brown loam about 6 inches thick. The subsoil is yellowish brown silty clay loam about 3 inches thick. The substratum is light yellowish brown and light olive brown silty clay about 18 inches thick over weathered shale. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of the Blueflat soil is slow. Available water capacity is 3 to 4 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Organic matter content is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Killpack and Blueflat soils is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and low water supplying capacity of the soil. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs and in Desert Clay range site.

26—Leeko fine sandy loam. This very deep, well drained soil is on alluvial fans and fan terraces throughout the central part of the survey area. It formed in alluvium derived dominantly from sandstone and shale. Slopes are 0 to 3 percent. They are generally concave and 50 feet long. The present vegetation in most areas is mat saltbush, galleta, and wedgeleaf saltbush. Elevation is 4,400 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 140 to 170 days.

Typically, the surface layer is light brown fine sandy loam 2 inches thick. The upper 3 inches of the subsoil is brown clay loam, and the lower 15 inches is brown loam. The upper 13 inches of the substratum is light brown sandy loam, the next 9 inches is light brown silt loam, and the lower part to a depth of 60 inches or more is light brown very fine sandy loam.

Included in this unit are about 10 percent shallow, clayey soils and 10 percent very deep, silty soils that are intermingled with areas of the Leeko soil and support some vegetation. Also included is about 15 percent very deep, loamy and silty soils that are along drainageways and support greasewood.

Permeability of the Leeko soil is moderately slow. Available water capacity is 9 to 11 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Leeko soil is 55 percent grasses, 10 percent forbs, and 35 percent shrubs. Important plants are galleta, Indian ricegrass, and wedgeleaf saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

The suitability of this unit for rangeland seeding is poor. The main limitations are the high content of alkali in the soil and low annual precipitation.

This map unit is in capability subclass VIIs and in Alkali Fan range site.

27—Lockerby-Shalako complex. This map unit is on mesas and cuestas west of Crescent Canyon, principally on Suluar Mesa. Slope is 1 to 15 percent. Elevation is 5,200 to 6,200 feet. The average annual precipitation is 10 to 13 inches, the mean annual air temperature is 45 to 50 degrees F, and the average freeze-free season is 100 to 140 days.

This unit is 45 percent Lockerby cobbly fine sandy loam, 3 to 15 percent slopes, in concave areas and 35 percent Shalako very fine sandy loam, 1 to 15 percent slopes, in convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 10 percent Rock outcrop on ridgetops and the edges of mesas; 5 percent shallow, loamy soils that are on higher, slightly convex mesas and ridgetops and support pinyon and Utah juniper; and 5 percent moderately deep, loamy soils that are near areas of the Lockerby soil and support Salina wildrye and shadscale.

The Lockerby soil is moderately deep and well drained. It formed in residuum and alluvium derived dominantly from sandstone and shale. Slopes are concave and less than 100 feet long. The present vegetation in most areas is Salina wildrye, Utah juniper, shadscale, and green rabbitbrush. Typically, about 47 percent of the surface is covered with rock fragments, of which 5 percent is cobbles, 40 percent is pebbles, and 2 percent is stones. The surface layer is pale brown cobbly fine sandy loam 3 inches thick. The subsoil is pale brown silty clay loam 9 inches thick. The substratum to a depth of 28 inches is light gray silty clay. Gypsiferous shale is at a depth of 28 inches. Depth to gypsiferous shale ranges from 20 to 40 inches.

Permeability of the Lockerby soil is very slow. Available water capacity is 3.0 to 7.5 inches. Water supplying capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Shalako soil is shallow and well drained. It formed in a thin mantle of alluvium over residuum derived dominantly from sandstone. Slopes are slightly convex and less than 50 feet long. The present vegetation in most areas is pinyon and Utah juniper. Typically, 5 percent of the surface is covered with pebbles. The surface layer is brown very fine sandy loam 2 inches thick. The subsoil is light brown loam 5 inches thick. The substratum is yellowish brown loam 8 inches thick over sandstone. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Shalako soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is less than 2 to 5 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Lockerby soil is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are Salina wildrye, needleandthread, and shadscale.

The potential vegetation on the Shalako soil is an overstory of pinyon and Utah juniper with a canopy of 60 percent. The understory vegetation is 15 percent grasses, 10 percent forbs, and 75 percent shrubs. Important plants are pinyon, Utah juniper, birchleaf mountainmahogany, and Mexican cliffrose.

Management practices that maintain or improve the rangeland vegetation on this unit include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the pinyon and Utah juniper on the Shalako soil are thinned, the desirable

plant species present can be expected to increase for a short period of time; however, pinyon and Utah juniper eventually will re-occupy the soil.

The suitability of this unit for rangeland seeding is very poor because of the shallow soil depth. It is not practical to revegetate large areas of this unit because of the shallow soil depth in some areas. To control erosion in areas where the need is critical, small areas may be mechanically treated and seeded. Plants that are suitable for seeding in these areas are adapted native plants, prostrate kochia, and crested wheatgrass.

The site index for pinyon and Utah juniper on the Shalako soil is 32. Average yield is 4 cords of wood per acre. The potential is poor for post or Christmas tree production.

This map unit is in capability subclass VIIs. The Lockerby soil is in Semidesert Stony Loam (Salina Wildrye) range site, and the Shalako soil is in Upland Shallow Loam (Pinyon-Utah Juniper) range site.

28—Mack loam, 2 to 6 percent slopes. This very deep, well drained soil is on alluvial fan pediments below the Book Cliffs. It formed in alluvium derived dominantly from sandstone and shale. Slopes are 200 to 300 feet long. The present vegetation in most areas is shadscale, spiny hopsage, galleta, and Indian ricegrass. Elevation is 4,600 to 5,200 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 150 to 170 days.

Typically, the surface layer is yellowish brown loam 3 inches thick. The upper 8 inches of the subsoil is brown loam, and the lower 5 inches is light yellowish brown silt loam. The substratum to a depth of 60 inches or more is light yellowish brown fine sandy loam and silt loam.

Included in this unit are about 10 percent very deep, loamy soils that have a very gravelly and cobbly substratum and are near the edges of fan pediments; 10 percent moderately deep, loamy soils that are on steep escarpments of fan pediments and support Salina wildrye; 5 percent very deep, loamy soils that are along drainageways and near escarpments and support fourwing saltbush; 5 percent very deep, loamy soils that are on the upper end of fan pediments and support Wyoming big sagebrush; and 5 percent very deep, loamy soils that are in drainageways and support black greasewood.

Permeability of the Mack soil is moderate. Available water capacity is about 8 to 11 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, recreation, and wildlife habitat.

The potential plant community on the Mack soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants.

This map unit is in capability subclass VIIc and in Desert Loam range site.

29—Mack-Sagers complex. This map unit is on alluvial fan pediments and plains. The unit is north of Interstate 70 and south of the Book Cliffs. Slope is 1 to 6 percent. Slopes are smooth to concave and 100 to 200 feet long. Elevation is 4,600 to 4,900 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 150 to 170 days.

This unit is °35 percent Mack loam, 2 to 6 percent slopes; 20 percent Mack silt loam, overwash, 2 to 6 percent slopes; and 20 percent Sagers silt loam, 1 to 3 percent slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent very deep, silty soils that have an accumulation of gypsum, are along drainageways, and support wedgeleaf saltbush, galleta, and mat saltbush; 5 percent moderately deep, silty soils and 5 percent shallow, clayey soils on pediments; and 5 percent very deep, loamy soils that are on the upper part of pediments and support Wyoming big sagebrush and spiny hopsage.

The Mack loam is very deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. The present vegetation in most areas is shadscale, galleta, and Indian ricegrass. Typically, the surface layer is yellowish brown loam 3 inches thick. The upper 8 inches of the subsoil is brown loam, and the lower 5 inches is light yellowish brown silt loam. The substratum to a depth of 60 inches or more is light yellowish brown loam and fine sandy loam.

Permeability of this Mack soil is moderate. Available water capacity is 8 to 11 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Mack silt loam, overwash, is very deep and well drained. It formed in alluvium derived dominantly from sandstone and shale. The present vegetation in most areas is wedgeleaf saltbush, galleta, and spiny horsebrush. Typically, the surface layer is pale brown silt loam 8 inches thick. The upper 11 inches of the subsoil is strong brown clay loam, and the lower 7 inches is brown clay loam. The upper 18 inches of the substratum is pink silt loam, and the lower part to a depth of 60 inches or more is light brown silt loam.

Permeability of this Mack soil is moderate. Available water capacity is 8 to 11 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Sagers soil is very deep and well drained. It formed in alluvium derived dominantly from shale. The present vegetation in most areas is wedgeleaf saltbush, galleta, and Indian ricegrass. Typically, the surface layer is pale brown silt loam 8 inches thick. The underlying material to a depth of 60 inches or more is pale brown and light brownish gray silty clay loam.

Permeability of the Sagers soil is moderately slow. Available water capacity is 9 to 11 inches. Water supplying capacity is 3.5 to 5.0 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Mack loam is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

The potential plant community on the Mack silt loam, overwash, is 35 percent grasses, 15 percent forbs, and 50 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and wedgeleaf saltbush.

The potential plant community on the Sagers soil is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe. The Mack loam is in Desert Loam range site, the Mack silt loam, overwash, is in Desert Shallow Loam (Shadscale) range site, and the Sagers silt loam is in Desert Clay range site.

30—Mesa fine sandy loam, 2 to 6 percent slopes. This very deep, well drained soil is on alluvial fan pediments and fan terraces, extending from the Book Cliffs out on the plains. These pediments are in higher lying areas than the surrounding areas of marine shale. The soil formed in mixed alluvium derived dominantly from sandstone and conglomerate. Slopes are smooth to convex and 150 to 300 feet long. The present vegetation in most areas is shadscale, galleta, Indian ricegrass, and winterfat. Elevation is 4,500 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 150 to 170 days.

Included in this unit are about 10 percent very deep, loamy soils that are in drainageways and support fourwing saltbush; 10 percent very deep, loamy soils that do not have very cobbly and gravelly material in the substratum; and 5 percent very deep, very gravelly soils that are near the edges of escarpments.

Typically, the surface is covered with pebbles of fine chert, quartz, and flint. The surface layer is light brown fine sandy loam about 3 inches thick. The upper 7 inches of the subsoil is reddish yellow fine sandy loam, and the lower 14 inches is reddish yellow and pink loam. The upper 13 inches of the substratum is pink gravelly loam, the next 17 inches is pink very gravelly fine sandy loam, and the lower part to a depth of 60 inches or more is reddish yellow loam.

Permeability of the Mesa soil is moderate. Available water capacity is 6.0 to 9.5 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Mesa soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants.

This map unit is in capability subclass VIIe and in Desert Loam range site.

31—Mesa-Chipeta-Thedalund family complex. This map unit is in highly dissected areas of the older alluvial fan pediments below the Book Cliffs. Slope is 2 to 50 percent. Elevation is 4,400 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit is 25 percent Mesa fine sandy loam, 2 to 6 percent slopes; 25 percent Chipeta silty clay loam, 25 to 50 percent slopes; and 20 percent Thedalund family soils, dry, 30 to 50 percent slopes. The Mesa soil is on alluvial fan pediments, and the Chipeta soils and Thedalund family soils, dry, are on the side slopes of alluvial fan pediments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 10 percent shallow, very gravelly, clayey soils that have slopes of 10 to 40 percent and support mat saltbush, galleta, shadscale, and wedgeleaf saltbush; 5 percent shallow, clayey soils on the foot slopes of escarpments; 5 percent Badland; 5 percent very deep, salt-affected soils that have slopes of 2 to 6 percent and support shadscale, galleta, wedgeleaf saltbush, and scattered greasewood; and 5 percent very deep, loamy soils in drainageways.

The Mesa soil is very deep and well drained. It formed in mixed alluvium derived dominantly from sandstone and conglomerate. Slopes are smooth to convex and commonly are less than 100 feet long. The present vegetation in most areas is galleta, shadscale, winterfat, and Indian ricegrass. Typically, the surface is covered with pebbles of fine quartz, flint, and chert. The surface layer is light brown fine sandy loam about 3 inches thick. The upper 7 inches of the subsoil is reddish yellow fine sandy loam, and the lower 14 inches is reddish yellow and pink loam. The upper 13 inches of the substratum is pink gravelly loam, the next 17 inches is pink very gravelly fine sandy loam, and the lower part to a depth of 60 inches or more is reddish yellow loam.

Permeability of the Mesa soil is moderate. Available water capacity is 6.0 to 9.5 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Chipeta soil is very shallow and well drained. It formed in alluvium and residuum derived dominantly from marine shale. Slopes are smooth and less than 25 feet long. The present vegetation in most areas is mat saltbush with some wedgeleaf saltbush, galleta, and Indian ricegrass. Typically, the surface layer is light olive brown silty clay loam about 3 inches thick. The underlying material to a depth of 8 inches is light brownish gray silty clay about 5 inches thick. Weathered shale is at a depth of 8 inches. Depth to weathered shale ranges from 5 to 10 inches.

Permeability of the Chipeta soil is slow. Available water capacity is less than 2.0 inches. Water supplying capacity is less than 2 inches. Effective rooting depth is 5 to 10 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

The Thedalund family soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from conglomerate and shale. Slopes are smooth, are less than 25 feet long, and generally face north. The present vegetation in most areas is Salina wildrye, wedgeleaf saltbush, and shadscale.

No single profile of the Thedalund family soils is typical but one commonly observed in the survey area has about 61 percent of the surface covered with rock fragments, of which 40 percent is pebbles, 15 percent is angular channery fragments, 5 percent is flagstones, and 1 percent is boulders. The surface layer is pale brown very gravelly sandy loam 4 inches thick. The next layer is very pale brown clay loam 5 inches thick. Below this to a depth of 24 inches is light gray silty clay loam. Weathered shale is at a depth of 24 inches. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of this Thedalund family soil is moderately slow. Available water capacity is 2.5 to 7.0 inches. Water supplying capacity is 2.5 to 6.0 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The potential plant community on the Mesa soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

The potential plant community on the Chipeta soil is 15 percent grasses, 15 percent forbs, and 70 percent shrubs. Important plants are mat saltbush, galleta, deserttrumpet, and bud sagebrush.

The potential plant community on the Thedalund family soil, dry, is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Salina wildrye, shadscale, broom snakeweed, and green rabbitbrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing system, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial

or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and restricted soil depth in some areas. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Mesa soil is in the Desert Loam range site, the Chipeta soil is in the Desert Shallow Clay range site, and the Thedalund family soils are in the Semidesert Shallow Loam (Salina Wildrye) range site.

32—Mesa-Trook complex. This map unit is on the lower edges of alluvial fan pediments and fan terraces below the Book Cliffs. Slopes are 2 to 6 percent and are 50 to 150 feet long. Elevation is 4,100 to 4,700 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit is 40 percent Mesa fine sandy loam and 30 percent Trook fine sandy loam. The Mesa soil is in smooth to concave areas, and the Trook soil is near the edges of pediments and in convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent very deep, sodium-affected soils that are in concave areas and support greasewood and wedgeleaf saltbush; 10 percent moderately deep, silty soils on side slopes; and 10 percent very deep, very gravelly soils that are on the sides of pediments and support shadscale, galleta, and wedgeleaf saltbush.

The Mesa soil is very deep and well drained. It formed in mixed alluvium derived dominantly from sandstone and conglomerate. The present vegetation in most areas is shadscale, galleta, and Indian ricegrass. Typically, the surface is covered with pebbles of fine quartz, flint, and chert. The surface layer is light brown fine sandy loam 3 inches thick. The upper 7 inches of the subsoil is reddish yellow fine sandy loam, and the lower 14 inches is reddish yellow and pink loam. The upper 13 inches of the substratum is pink gravelly loam, the next 17 inches is pink very gravelly fine sandy loam, and the lower part to a depth of 60 inches or more is reddish yellow loam.

Permeability of the Mesa soil is moderate. Available water capacity is 6.0 to 9.5 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Trook soil is very deep and well drained. It formed in mixed alluvium derived dominantly from sandstone and conglomerate. The present vegetation in most areas is shadscale, Indian ricegrass, and fourwing saltbush. Typically, the surface is covered with pebbles of fine quartz, flint, and chert. The surface layer is light brown fine sandy loam about 5 inches thick. The subsoil is light brown fine sandy loam about 7 inches thick. The upper 20 inches of the substratum is very pale brown fine sandy loam, and the lower part to a depth of 60 inches or more is white very gravelly sandy loam.

Permeability of the Trook soil is moderate. Available water capacity is 4.5 to 7.5 inches. Water supplying capacity is 3.5 to 4.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Mesa soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

The potential plant community on the Trook soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Indian ricegrass, fourwing saltbush, and shadscale.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought can adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the rangeland may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for critical area seedings are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe. The Mesa soil is in Desert Loam range site, and the Trook soil is in Desert Sandy Loam range site.

33—Mido loamy fine sand, 2 to 20 percent slopes. This very deep, excessively drained soil is on cuestas and broad structural benches on the leeward side of ridges and in depressional areas. The soil is on Bartlett Flat and Bartlett Wash. It formed in eolian material derived dominantly from sandstone. Slope ranges from 2 to 20 percent but is commonly less than 10 percent. Slopes commonly are 50 to 150 feet long. The present vegetation in most areas is Mormon-tea, Indian ricegrass, sandhill muhly, galleta, and some sand sagebrush. Elevation is 4,700 to 5,200 feet. The average annual precipitation is about 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 140 to 160 days.

Typically, the surface layer is reddish yellow loamy fine sand about 7 inches thick. The underlying material to a depth of 60 inches or more is reddish yellow loamy fine sand. About 5 to 10 percent of the surface is characterized by hummocks that are 1 to 2 feet high.

Included in this unit are about 15 percent shallow, sandy soils around areas of Rock outcrop; 5 percent Rock outcrop; and 5 percent loamy soils that are 20 to 40 inches deep over sandstone and support Indian ricegrass, galleta, and Mormon-tea. Also included are small areas of sandy soil that have sandstone at a depth of 40 to 60 inches.

Permeability of the Mido soil is rapid. Available water capacity is 3.0 to 5.5 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is about 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community of Mido soil is 50 percent grasses, 15 percent forbs, and 35 percent shrubs. Important plants are Indian ricegrass, Mormon-tea, dropseed, fourwing saltbush, and sandhill muhly.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the desirable forage plants are depleted, chemical spraying and seeding can be used to improve the rangeland vegetation. Because of the hazard of soil blowing, it is desirable to apply improvement practices that cause the least amount of soil disturbance.

The suitability of this unit for rangeland seeding is poor. The main limitations are the hazard of soil blowing and the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants suitable for seeding include fourwing saltbush, Indian ricegrass, sand dropseed, and other native plants.

The map unit is in capability subclass VIIs and in Semidesert Sand range site.

34—Mido-Sazi complex. This map unit is on broad cuestas and structural benches in the southern part of the survey area, between the Green and Colorado Rivers. Slope is 2 to 20 percent. Elevation is 4,700 to 5,800 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 140 to 160 days.

This unit is 50 percent Mido loamy fine sand, 2 to 20 percent slopes, and 30 percent Sazi fine sandy loam, dry, 2 to 10 percent slopes. These soils are mostly in open areas that are gently rolling. The Mido soil is mainly in concave areas, and the Sazi soil is mainly in convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent shallow, sandy soils that are on the edges of open areas adjacent to the areas of Rock outcrop and support blackbrush and Utah juniper, 5 percent very deep, loamy soils that are intermingled with areas of the Sazi soil and support similar vegetation, and 5 percent Rock outcrop.

The Mido soil is very deep and excessively drained. It formed in eolian material derived dominantly from sandstone. Slope ranges from 2 to 20 percent but is dominantly 2 to 10 percent. Slopes commonly are 50 feet long. The present vegetation in most areas is Mormon-tea, Indian ricegrass, sandhill muhly, and some sand sagebrush and eriogonum. Typically, the surface layer is reddish yellow loamy fine sand 7 inches thick. The underlying material to a depth of more than 60 inches is reddish yellow loamy fine sand. The soil is characterized by hummocks, 1 to 2 feet high and 5 to 15 feet in diameter.

Permeability of the Mido soil is rapid. Available water capacity is 3.0 to 5.5 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 60 inches or more. Organic matter content of the surface layer is about 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

The Sazi soil, dry, is moderately deep and well drained. It formed in eolian and alluvial material derived dominantly from sandstone. Slope ranges from 2 to 10 percent but is dominantly 2 to 5 percent. Slopes commonly are 50 to 150 feet long. The present vegetation in most areas is galleta, Indian ricegrass, Mormon-tea, needleandthread, and some fourwing saltbush. Typically, the surface layer is strong brown fine sandy loam 4 inches thick. The subsoil is yellowish red fine sandy loam 13 inches thick. The substratum is reddish yellow fine sandy loam 17 inches thick over sandstone. Sandstone is at a depth of 34 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Sazi soil is moderately rapid. Available water capacity is 2.5 to 6.0 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. Organic matter content of the surface layer is 1 to 2 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on Mido soil is 50 percent grasses, 15 percent forbs, and 35 percent shrubs. Important plants are Indian ricegrass, Mormon-tea, dropseed, fourwing saltbush, and sandhill muhly.

The potential plant community on Sazi soil, dry, is 60 percent grasses, 15 percent forbs, and 25 percent shrubs. Important plants are needleandthread, Indian ricegrass, and fourwing saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the desirable forage plants are depleted, chemical spraying and seeding can be used to improve the rangeland vegetation. It is desirable to apply improvement practices that cause the least amount of soil disturbance because of the hazard of soil blowing.

The suitability of this unit for rangeland seeding is poor. The main limitations are the hazard of soil blowing and the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants suitable for seeding include fourwing saltbush, Indian ricegrass, sand dropseed, and other native plants.

This map unit is in capability subclass VIIs. The Mido soil is in Semidesert Sand range site, and the Sazi soil, dry, is in Semidesert Sandy Loam range site.

35—Moenkopie-Rock outcrop complex. This map unit is on structural benches, mesas, and ridgetops in the southern part of the survey area. Slope is 3 to 20 percent. Elevation is 4,100 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free period is 150 to 180 days.

This unit is about 60 percent Moenkopie fine sandy loam, 3 to 20 percent slopes, and 15 percent Rock outcrop. The Moenkopie soils are on benches and mesas, and the Rock outcrop occurs as escarpments, ledges, monoliths, and slickrock. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent loamy, moderately deep and deep soils that are in slightly concave areas and support shadscale, galleta, and Indian ricegrass; 5 percent moderately deep and deep, sandy soils that are in concave areas, generally near drainageways, and support sand sagebrush, Mormon-tea, and Indian ricegrass; and 5 percent Moenkopie soils that have slopes of more than 20 percent.

The Moenkopie soil is very shallow and shallow and is well drained. It formed in residual and eolian material derived dominantly from sandstone. Slope ranges from 3 to 20 percent but commonly is less than 10 percent. Slopes are concave to convex and 50 to 150 feet long. The present vegetation in most areas is Mormon-tea, shadscale, and Indian ricegrass. Typically, the surface layer is light reddish brown fine sandy loam about 2 inches thick. The upper 14 inches of the underlying material is light reddish brown sandy loam, and the lower part to a depth of 19 inches is light reddish brown sandy loam. Sandstone is at a depth of 19 inches. Depth to sandstone ranges from 5 to 20 inches.

Permeability of the Moenkopie soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is less that 2.5 inches. Effective rooting depth is 5 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Rock outcrop consists of gently sloping to sloping, exposed areas of sandstone. In some areas, singleleaf ash and Utah juniper grow in the cracks and crevices and immediately downslope of the areas of slickrock. The risk of erosion is higher in disturbed areas immediately downslope of Rock outcrop as a result of runoff.

The potential plant community on the Moenkopie soil is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and blackbrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and restricted soil depth. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Moenkopie soil is in Desert Shallow Sandy Loam range site.

36—Moenkopie-Shalako-Sandoval complex. This map unit is on cuestas and shale pediments south of Interstate 70 and east of Cisco. Slope is 3 to 20 percent. Elevation is 4,700 to 5,000 feet. The average annual precipitation is 7 to 10 inches, the mean annual air temperature is 51 to 54 degrees F, and the average freeze-free period is 130 to 160 days.

This unit is about 30 percent Moenkopie fine sandy loam, 3 to 20 percent slopes; 25 percent Shalako gravelly sandy loam, dry, 3 to 8 percent slopes; and 20 percent Sandoval silt loam, 3 to 15 percent slopes. The Moenkopie soil generally is on south and east aspects, the Shalako soil is on north aspects and in the higher lying areas, and the Sandoval soil is throughout the unit.

Included in this unit are about 5 percent very deep, sodium-affected soils in drainageways and near springs; 5 percent Rock outcrop at the crest of cuestas; 5 percent very deep, loamy soils that are in the lower lying areas on north aspects and support Wyoming big sagebrush; 5 percent moderately deep, loamy soils that are on escarpments and support Salina wildrye; and 5 percent very deep, sandy soils in concave areas.

The Moenkopie soil is very shallow and shallow and is well drained. It formed in residual and eolian material

derived dominantly from sandstone. Slopes are generally less than 25 feet long. The present vegetation in most areas is shadscale, galleta, and Indian ricegrass. Typically, the surface layer is light reddish brown fine sandy loam 2 inches thick. The upper 14 inches of the underlying material is light reddish brown sandy loam, and the lower part to a depth of 19 inches is light reddish brown sandy loam. Sandstone is at a depth of 19 inches. Depth to sandstone ranges from 5 to 20 inches.

Permeability of the Moenkopie soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is less than 2.5 inches. Effective rooting depth is 5 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Shalako soil is shallow and well drained. It formed in residuum and alluvium derived dominantly from sandstone. Slopes are convex and generally less than 30 feet long. The present vegetation in most areas is Utah juniper, shadscale, Wyoming big sagebrush, and green rabbitbrush. Typically, 45 percent of the surface is covered with rock fragments, of which 15 percent is channery fragments and 30 percent is pebbles. The surface layer is light yellowish brown gravelly sandy loam 1 inch thick. The subsoil is light yellowish brown fine sandy loam 3 inches thick. The substratum is very pale brown gravelly loam 6 inches thick. Sandstone is at a depth of 10 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Shalako soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Sandoval soil is shallow and well drained. It formed in residuum and alluvium derived dominantly from shale. Slopes are generally concave and less than 30 feet long. The present vegetation in most areas is Salina wildrye, shadscale, and galleta. Typically, the surface layer is light brownish gray silt loam 2 inches thick. The next layer is light brownish gray silt loam 16 inches thick. Weathered shale is at a depth of 18 inches. Depth to weathered shale is 10 to 20 inches.

Permeability of the Sandoval soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Moenkopie soil is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and blackbrush.

The potential vegetation on the Shalako, dry, soil is an overstory of Utah juniper and pinyon with a canopy of 30 percent. The understory vegetation is 15 percent grasses, 5 percent forbs, and 80 percent shrubs. Important plants are birchleaf mountainmahogany, black sagebrush, Salina wildrye, and Utah juniper.

The potential plant community on the Sandoval soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Salina wildrye, shadscale, broom snakeweed, and green rabbitbrush.

Management practices that maintain or improve the rangeland vegetation on this unit include proper grazing use, planned grazing systems, and proper location of livestock watering developments. It is not practical to revegetate large areas of this unit because of the low annual precipitation and restricted soil depth. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

The site index for Utah juniper and pinyon on the Shalako soil is 40. Average yield is 6 cords of wood per acre. The potential is good for post or Christmas tree production.

This map unit is in capability subclass VIIe. The Moenkopie soil is in Desert Shallow Sandy Loam. The Shalako soil is in Semidesert Shallow Loam (Utah Juniper-Pinyon) range site. The Sandoval soil is in Semidesert Shallow Loam (Salina Wildrye).

37—Moepitz Variant very stony loam, 2 to 10 percent slopes. This deep, well drained soil is on alluvial fans below the canyon walls along the Green and Colorado Rivers. It formed in alluvium and colluvium derived dominantly from sandstone. Slopes are generally smooth to convex and 100 to 200 feet long. The present vegetation in most areas is galleta, shadscale, sand dropseed, Mormon-tea, and rubber rabbitbrush. Elevation is 4,000 to 4,400 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 56 degrees F, and the average freeze-free season is 160 to 180 days.

Typically, about 48 percent of the surface is covered with rock fragments, of which 5 percent is stones, 18 percent is cobbles, and 25 percent is pebbles. The surface layer is reddish brown very stony sandy loam 6 inches thick. The underlying material to a depth of 45 inches is light reddish brown cobbly coarse sandy loam and coarse sandy loam. Sandstone is at a depth of 45 inches. Depth to sandstone ranges from 40 to 60 inches.

Included in this unit are about 10 percent very deep, loamy soils above the banks of the Colorado and Green

Rivers and along minor drainageways dissecting the fans and 5 percent Rock outcrop.

Permeability of the Moepitz Variant soil is moderately rapid. Available water capacity is 2.5 to 6.5 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 40 to 60 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The potential plant community on the Moepitz Variant soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Indian ricegrass, fourwing saltbush, and shadscale.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe and in Desert Sandy Loam range site.

38—Muff family-Badland complex. This map unit is on hills and alluvial fans in the southern part of the survey area. Slopes are 1 to 50 percent and are less than 100 feet long. The present vegetation in most areas is wedgeleaf saltbush, shadscale, galleta, and black greasewood. Elevation is 4,000 to 4,700 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 56 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is 40 percent Muff family, 1 to 50 percent slopes, and 30 percent Badland. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 10 percent moderately deep and deep, sandy soils that are in pockets and support sand sagebrush, Indian ricegrass, and forbs; 5 percent shallow, loamy soils near rock ledges; 5 percent very deep, salt-affected soils in concave areas along drainageways; 5 percent very deep, loamy soils that are on benches and support fourwing saltbush; and 5 percent Rock outcrop that occurs as cliffs and ledges.

The Muff family soils are moderately deep and well drained. They formed in residuum, alluvium, and colluvium derived dominantly from shale. No single profile of the Muff family soils is typical, but one commonly observed in the survey area has about 44 percent of the surface covered with rock fragments, of which 2 percent is boulders, 7 percent is stones, 10 percent is cobbles, and 25 percent is pebbles. The surface layer is reddish brown very bouldery fine sandy loam 3 inches thick. The upper 9 inches of subsoil is reddish brown clay loam, and the lower 11 inches is reddish brown sandy clay loam. The underlying material to a depth of 29 inches is pink sandy clay loam. Weathered shale is at a depth of 29 inches. Depth to shale ranges from 20 to 40 inches.

Permeability of this Muff family soil is slow. Available water capacity is 3.5 to 5.0 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium to rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

Badland consists of barren areas of actively eroding shale, some of which is interbedded with gypsum and thin layers of sandstone. The areas of Badland are highly dissected by drainageways. Angular ridges and nose slopes are prominent.

The potential plant community on the Muff family soils is 55 percent grasses, 10 percent forbs, and 35 percent shrubs. Important plants are galleta, Indian ricegrass, and wedgeleaf saltbrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

The suitability of the Muff family soils for rangeland seeding is poor. The main limitations are the high content of alkali in the soil and the low annual precipitation.

This map unit is in capability class VIII. The Muff family soils are in Alkali Fan range site.

39—Myton family-Rock outcrop complex. This map unit is on the sides of deep canyons throughout the southern half of the survey area. Slope is 50 to 70 percent. Elevation is 4,000 to 5,700 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit is about 40 percent Myton family soils, 50 to 70 percent slopes, and 25 percent Rock outcrop. The Myton family soils are on canyonsides, and Rock outcrop occurs as very steep canyon walls and ledges throughout the unit. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent shallow, loamy soils that are on ledges and benches and support shadscale, blackbrush, and wedgeleaf saltbush; 10 percent soils, in dry washes, that are frequently reworked by streams and support little if any vegetation; and 10 percent very deep, loamy soils that are on canyon floors

and stream bottoms and support black greasewood and basin big sagebrush.

The Myton family soils are moderately deep to deep and are well drained. These soils formed in colluvium and residuum derived dominantly from sandstone. Slopes are convex and are generally less than 75 feet long. The present vegetation in most areas is Salina wildrye, shadscale, galleta, blackbrush, and Bigelow sagebrush. No single profile of Myton family soils is typical, but one commonly observed in the survey area has about 86 percent of the surface covered with rock fragments, of which 1 percent is boulders, 20 percent is stones, 35 percent is cobbles, and 30 percent is pebbles. The surface layer is reddish brown extremely stony sandy loam 29 inches thick over sandstone. Depth to sandstone ranges from 20 to 60 inches or more.

Permeability of this Myton family soil is moderately rapid. Available water capacity is 1.5 to 3.0 inches. Water supplying capacity is 1 to 3 inches. Effective rooting depth is 20 to 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is very rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used for wildlife habitat.

The potential plant community on the Myton family soils is 45 percent grasses, 15 percent forbs, and 40 percent shrubs. Important plants are Salina wildrye, galleta, Indian ricegrass, Bigelow sagebrush, and Mormon-tea.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

The suitability of the Myton family soils for rangeland seeding is very poor. The main limitations are the rock fragments on the surface and steepness of slope.

This map unit is in capability subclass VIIs. The Myton family soils are in Talus Slope range site.

40—Nakai fine sandy loam, 3 to 10 percent slopes. This deep, well drained soil is on canyon floors and structural benches in the southern part of the survey area. It formed in eolian, residual, and alluvial material derived dominantly from sandstone. Slopes are convex to concave and 100 to 300 feet long. The present vegetation in most areas is galleta, Indian ricegrass, sand dropseed, and Mormon-tea. Elevation is 4,100 to 5,000 feet. The average annual precipitation is about 5 to 8 inches, the mean annual air temperature is 52 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

Typically, the surface layer is light reddish brown fine sandy loam about 3 inches thick. The subsoil is brown fine sandy loam 6 inches thick. The substratum is light reddish brown fine sandy loam 49 inches thick. Sandstone is at a depth of 58 inches. Depth to sandstone ranges from 40 to 60 inches.

Included in this unit are about 10 percent shallow, loamy soils that are near the edge of structural benches on slope breaks and support blackbrush and 5 percent Rock outcrop at the edge of structural benches. Also included are small areas of loamy soils that are more than 60 inches thick.

Permeability of the Nakai soil is moderately rapid. Available water capacity is 5.0 to 9.5 inches. Water supplying capacity is 2.5 to 5.0 inches. Effective rooting depth is 40 to 60 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Nakai soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Indian ricegrass, fourwing saltbush, and shadscale.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe and in Desert Sandy Loam range site.

41—Nakai-Moenkopie complex. This map unit is on structural benches and ridgetops near the Green River, north of Ten Mile Canyon and south of Red Wash. Slope is 1 to 20 percent. Elevation is 4,000 to 4,600 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is about 40 percent Nakai loamy fine sand, hummocky, 1 to 8 percent slopes, and 30 percent Moenkopie fine sandy loam, 3 to 20 percent slopes. The Nakai soil is mostly on the lower lying side slopes of structural benches, and the Moenkopie soil is on benches and ridges adjacent to areas of Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent moderately deep, loamy soils that support vegetation similar to that on the Nakai soil, 10 percent Rock outcrop, and 10 percent very deep, sandy soils. The moderately deep, loamy soils are intermingled with the Nakai soil, the areas of Rock outcrop are intermingled with the

Moenkopie soil, and the very deep, sandy soils are in small, isolated areas, mainly in valley bottoms and concave areas.

The Nakai soil is deep and well drained. It formed in eolian and alluvial material derived dominantly from sandstone. Slopes are concave to convex and 25 to 50 feet long. The present vegetation in most areas is galleta, Indian ricegrass, sand dropseed, and Mormon-tea. Typically, the surface layer is reddish yellow loamy fine sand about 3 inches thick. The subsoil is red fine sandy loam 19 inches thick. The upper 11 inches of the substratum is reddish brown fine sandy loam, and the lower part to a depth of 51 inches is reddish yellow fine sandy loam. Sandstone is at a depth of 51 inches. Depth to sandstone ranges from 40 to 60 inches.

Permeability of the Nakai soil is moderately rapid. Available water capacity is 5.0 to 9.5 inches. Water supplying capacity is 2.5 to 5.0 inches. The organic matter content of the surface layer is less than 1 percent. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

The Moenkopie soil is very shallow and shallow and is well drained. It formed in residual and eolian material derived dominantly from sandstone. Slope ranges from 3 to 20 percent but commonly is less than 10 percent. Slopes are convex and generally less than 25 feet long. The present vegetation in most areas is galleta, blackbrush, Mormon-tea, and Indian ricegrass. Scattered Utah juniper is in some areas at higher elevations. Typically, the surface layer is light reddish brown fine sandy loam about 2 inches thick. The upper 14 inches of the underlying material is light reddish brown sandy loam, and the lower part to a depth of 19 inches is light reddish brown sandy loam. Sandstone is at a depth of 19 inches. Depth to sandstone ranges from 5 to 20 inches.

Permeability of the Moenkopie soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is less than 2.5 inches. Effective rooting depth is 5 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Nakai soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Indian ricegrass, fourwing saltbush, and shadscale.

The potential plant community on the Moenkopie soil is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and blackbrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and restricted soil depth. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Nakai soil is in Desert Sandy Loam range site, and the Moenkopie soil is in Desert Shallow Sandy Loam range site.

42—Nakai-Redlands complex. This map unit is on structural benches and canyon floors south of Interstate 70, near White Canyon, and east of Cisco. The present vegetation in most areas is galleta, Indian ricegrass, sand dropseed, Mormon-tea, and eriogonum. Slope is 1 to 10 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free period is 160 to 180 days.

This unit is 40 percent Nakai loamy fine sand, hummocky, 1 to 8 percent slopes, and 30 percent Redlands fine sandy loam, 3 to 10 percent slopes. The Nakai soil is in convex areas, and the Redlands soil is in concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent shallow, loamy soils that are near areas of Rock outcrop and support blackbrush and shadscale, 10 percent very deep, sandy soils in concave areas where eolian material has accumulated, 5 percent Rock outcrop near the edge of mapped areas, and 5 percent very deep, loamy soils that are in drainageways and support black greasewood, seepweed, and shadscale.

The Nakai soil is deep and well drained. It formed in eolian alluvial material derived dominantly from sandstone. Slopes are 25 to 50 feet long. Typically, the surface layer is reddish yellow loamy fine sand about 3 inches thick. The subsoil is red fine sandy loam 19 inches thick. The upper 11 inches of the substratum is reddish brown fine sandy loam, and the lower part to a depth of 51 inches is reddish yellow fine sandy loam. Sandstone is at a depth of 51 inches. Depth to sandstone ranges from 40 to 60 inches.

Permeability of the Nakai soil is moderately rapid. Available water capacity is 5.0 to 9.5 inches. Water supplying capacity is 2.5 to 5.0 inches. The organic matter content of the surface layer is less than 1 percent. Effective rooting depth is 40 to 60 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe. In the area near

White Canyon, this soil has hummocks of sand ranging from 1 to 3 feet in height and 5 to 30 feet in diameter.

The Redlands soil is deep and well drained. It formed in eolian and alluvial material derived dominantly from sandstone. Slopes are 25 to 50 feet long. Typically, the surface layer is reddish brown fine sandy loam 8 inches thick. The upper 6 inches of the subsoil is reddish brown sandy clay loam, and the lower 29 inches is red fine sandy loam. The substratum to a depth of 59 inches is light reddish brown fine sandy loam. Sandstone is at a depth of 59 inches. Depth to sandstone is 40 to 60 inches.

Permeability of the Redlands soil is moderate. Available water capacity is 4 to 8 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 40 to 60 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Nakai and Redlands soils is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Indian ricegrass, fourwing saltbush, and shadscale.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe and in Desert Sandy Loam range site.

43—Nakai-Sheppard complex. This map unit is on valley fills and structural benches near Tusher Wash, east of the Green River, and near Cottonwood Wash, north of the Colorado River. Slope is 1 to 10 percent. Elevation is 4,000 to 4,500 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is about 60 percent Nakai loamy fine sand, 1 to 8 percent slopes, and 25 percent Sheppard loamy fine sand, 2 to 10 percent slopes. The Nakai soil is in smooth to concave areas, and the Sheppard soil is in convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent very deep, loamy soils that are on remnants of eroded fan pediments and support shadscale and 5 percent shallow, clayey soils that are in convex areas along drainageways and support wedgeleaf saltbush and mat saltbush.

The Nakai soil is deep and well drained. It formed in eolian and alluvial material derived dominantly from sandstone. Slopes are 100 to 200 feet long. The present vegetation in most areas is fourwing saltbush, winterfat, Indian ricegrass, and galleta. Typically, the surface layer is brown loamy fine sand about 2 inches thick. The subsoil is strong brown fine sandy loam 10 inches thick. The upper 17 inches of the substratum is strong brown fine sandy loam, the next 18 inches is reddish yellow fine sandy loam, and the lower part to a depth of 59 inches is light brown fine sandy loam. Sandstone is at a depth of 59 inches. Depth to sandstone ranges from 40 to 60 inches.

Permeability of the Nakai soil is moderately rapid. Available water capacity is 5.0 to 9.5 inches. Water supplying capacity is 2.5 to 5.0 inches. Effective rooting depth is 40 to 60 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

The Sheppard soil is very deep and somewhat excessively drained. It formed in eolian material derived dominantly from sandstone. Slopes are less than 50 feet long. The present vegetation in most areas is sand sagebrush, eriogonum, sand dropseed, and Indian ricegrass. Typically, the soil is light yellowish brown loamy fine sand to a depth of 60 inches or more.

Permeability of the Sheppard soil is rapid. Available water capacity is 3.5 to 5.0 inches. Water supplying capacity is 2.5 to 4.0 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used as rangeland and recreation areas.

The potential plant community on the Nakai soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Indian ricegrass, fourwing saltbush, and shadscale. The potential plant community on the Sheppard soil is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are Indian ricegrass, dropseed, and shrubby eriogonum. Management practices that maintain or improve the vegetation include proper grazing use, planned grazing systems, and livestock watering developments. Severe drought may adversely affect the production of perennial vegetation. Partial or total removal of livestock from the range may be necessary.

The suitability of the Nakai and Sheppard soils for rangeland seeding is poor. The main limitations are the low average annual precipitation and the hazard of soil blowing. To control erosion in areas where the need is

critical, small areas can be mechanically treated and seeded. Adapted native plants are suitable for seeding in these areas.

This map unit is in capability subclass VIIe. The Nakai soil is in Desert Sandy Loam range site, and the Sheppard soil is in Desert Sand range site.

44—Pennell sandy loam, 3 to 15 percent slopes. This very shallow and shallow, well drained soil is on structural benches and cuestas east of the Green River and west of Horse Canyon, in the Book Cliffs. It formed in residuum derived dominantly from sandstone. Slope ranges from 3 to 15 percent but is commonly 3 to 8 percent. Slopes are smooth to convex and are less than 100 feet long. The present vegetation in most areas is blackbrush, shadscale, and galleta. Elevation is 5,000 to 5,400 feet. The average annual precipitation is 7 to 9 inches, the mean annual air temperature is 49 to 5l degrees F, and the average freeze-free season is 130 to 150 days.

Typically, 30 percent of the surface is covered with pebbles. The surface layer is brown sandy loam 4 inches thick. The subsoil is brown fine sandy loam 3 inches thick. The substratum is pink gravelly sandy clay loam 6 inches thick. Sandstone is at a depth of 13 inches. Depth to sandstone ranges from 8 to 20 inches.

Included in this unit are 10 percent shallow, loamy soils that are on plains and support Salina wildrye; 5 percent shallow, clayey soils that are on hills and support wedgeleaf saltbush; 5 percent deep, loamy soils that are on alluvial fans and support shadscale and galleta; 5 percent Rock outcrop that occurs as ledges and rims; and 5 percent moderately deep, loamy soils that are underlain by shale, are intermingled with areas of the Pennell soil, and support vegetation similar to that on the Pennell soil.

Permeability of the Pennell soil is moderate. Available water capacity is less than 4 inches. Water supplying capacity is 1 to 4 inches. Effective rooting depth is 8 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Pennell soil is 25 percent grasses, 5 percent forbs, and 70 percent shrubs. Important plants are blackbrush, galleta, Indian ricegrass, and slenderbush eriogonum.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the restricted soil depth, low annual precipitation, and the hazard of soil blowing. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Adapted native plants are suitable for seeding in these areas.

This map unit is in capability subclass VIIs and in Desert Shallow Sandy Loam (Blackbrush) range site.

45—Razorba family, 50 to 80 percent slopes. These deep to very deep, well drained soils are on mountainsides throughout the Book Cliffs. They formed in colluvium and residuum derived from sandstone and shale. Slopes are convex, are 75 to 150 feet long, and face north. The present vegetation in most areas is Gambel oak, mountain big sagebrush, Utah serviceberry, and snowberry. Elevation is 6,400 to 8,800 feet. The average annual precipitation is 16 to 24 inches, the mean annual air temperature is 35 to 42 degrees F, and the average freeze-free season is 30 to 90 days.

No single profile is typical of the Razorba family soils, but one commonly observed in the survey area has a 3-inch-thick layer of partially decomposed leaves and twigs on the surface. The upper 8 inches of the surface layer is very dark grayish brown fine sandy loam, and the lower part is dark brown fine sandy loam 12 inches thick. The subsoil is dark brown and brown fine sandy loam 27 inches thick. The substratum to a depth of 60 inches or more is yellowish brown fine sandy loam. Depth to sandstone ranges from 40 to 60 inches or more.

Included in this unit are 10 percent very deep, loamy soils that are in more nearly level areas and support Gambel oak; 5 percent moderately deep soils that are on very steep, south-facing slopes and support pinyon and Utah juniper; 5 percent deep, loamy, dark-colored soils that are in concave areas and support Douglas-fir; and 5 percent Rock outcrop.

Permeability of this Razorba family soil is moderate. Available water capacity is about 5.5 to 9.0 inches. Water supplying capacity is 5 to 16 inches. Effective rooting depth is 40 to 60 inches or more. The organic matter content of the surface layer is more than 5 percent. Runoff is moderate, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used for wildlife habitat.

The potential plant community on this unit is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are Gambel oak, Columbia needlegrass, mountain brome, Utah serviceberry, and snowberry. The unit is limited for use by livestock because of the steepness of slope.

The suitability of this unit for rangeland seeding is poor. The main limitation is steepness of slope.

This map unit is in capability subclass VIIe and in Mountain Very Steep Loam (Oak) range site.

46—Redbank family. These very deep, well drained soils are on flood plains and valley floors throughout the Book Cliffs. The soils formed in alluvium derived dominantly from sandstone and shale. Slopes are 0 to 3

percent, are smooth to concave, and are less than 100 feet long. The present vegetation in most areas is black greasewood, saltgrass, shadscale, and mat saltbush. Elevation is 4,800 to 5,700 feet. The average annual precipitation is 8 to 11 inches, the mean annual air temperature is 50 to 53 degrees F, and the average freeze-free season is 120 to 160 days.

No single profile of the Redbank family soils is typical, but one commonly observed in the survey area has a surface layer of brown sandy clay loam 2 inches thick. The next layer is brown fine sandy loam 30 inches thick. The upper 8 inches of the underlying material is brown fine sandy loam, the next 7 inches is brown loam, and the lower part to a depth of 60 inches or more is brown sandy loam.

Included in this unit are 5 percent areas of unstabilized sandy and gravelly sediment that is reworked by streams so frequently that it supports little if any vegetation; 5 percent very deep, loamy soils that are along stream channels at the higher elevations and support basin big sagebrush; and 5 percent very deep, silty and loamy soils that are along stream channels at the lower end of mapped areas and support black greasewood, shadscale, wedgeleaf saltbush, and alkali sacaton.

Permeability of this Redbank family soil is moderately rapid. Available water capacity is 3 to 10 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. These soils are subject to occasional, very brief periods of flooding during intense storms in December through May and August through October.

This unit is used as rangeland and wildlife habitat.

The potential plant community on this unit is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are alkali sacaton, galleta, seepweed, and black greasewood.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and the content of alkali in the soil. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants, prostrate kochia, and Russian wildrye.

This map unit is in capability subclasses IIIc, irrigated, and VIc, nonirrigated. It is in Alkali Flat range site.

47—Redbank-Flatnose families association. This map unit is on the flood plains of the Green and Colorado Rivers. Slope is 0 to 3 percent. Slopes are 10 to 100 feet long and smooth. Elevation is 4,000 to 4,100 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is 45 percent Redbank family soils and 40 percent Flatnose family soils. The Redbank family soils are in higher, better drained areas, and the Flatnose family soils are along stream channels, sloughs, and riverbanks. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 5 percent very deep, silty soils that are along drainageways that flow into the Green and Colorado Rivers and support wedgeleaf saltbush and black greasewood; 5 percent areas of frequently reworked sediment in stream channels that supports little if any vegetation; and 5 percent shallow, loamy soils that are on benches above rivers and support shadscale.

The Redbank family soils are very deep and well drained. They formed in alluvium derived from sandstone and shale. The present vegetation in most areas is saltcedar, inland saltgrass, greasewood, and alkali sacaton. No single profile is typical of these soils, but one commonly observed in the survey area has a surface layer of reddish brown fine sandy loam 8 inches thick. The next layer is reddish brown sandy loam 5 inches thick. The upper 11 inches of the underlying material is red gravelly loamy coarse sand, the next 22 inches is red sandy loam, and the lower part to a depth of 60 inches or more is red loamy coarse sand.

Permeability of this Redbank family soil is moderately rapid. Available water capacity is 3 to 10 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is very slow to slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. These soils are subject to stream erosion and occasional, very brief periods of flooding in spring and early in summer.

The Flatnose family soils are very deep and somewhat poorly drained. They formed in alluvium derived from sandstone and shale. The present vegetation in most areas is alkali sacaton, saltcedar, Fremont cottonwood, and seepweed. No single profile of these soils is typical, but one commonly observed in the survey area has a surface layer of pale brown sandy clay loam 5 inches thick. The upper 6 inches of the underlying material is pale brown fine sandy loam, the next 19 inches is light brown fine sandy loam, and the lower part to a depth of 60 inches or more is reddish brown sandy loam.

Permeability of this Flatnose family soil is moderate or moderately rapid. Available water capacity is 5.5 to 10.0 inches. Effective rooting depth is 60 inches or more. A water table is at a depth of 20 to 60 inches in spring. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion

is slight. The hazard of soil blowing is slight. These soils are subject to stream erosion and to occasional, brief to long periods of flooding in spring and early in summer.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Redbank family soils is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are alkali sacaton, galleta, seepweed, and black greasewood.

The potential plant community on the Flatnose family soils is 55 percent grasses, 5 percent forbs, and 40 percent shrubs. Important plants are inland saltgrass, alkali sacaton, skunkbush sumac, and Fremont cottonwood.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and the content of alkali in the soil. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants, prostrate kochia, and Russian wildrye.

This map unit is in capability subclasses IIIs, irrigated, and VIs, nonirrigated. The Redbank family soils are in Alkali Flat range site, and the Flatnose family soils are in Salt Riparian Stream Bank range site.

48—Redbank-Flatnose, cool, families association. This map unit is on flood plains and valley bottoms, mainly near Horse and Middle Canyons, in the Book Cliffs. Slopes are 0 to 8 percent, smooth to concave, and less than 100 feet long. Elevation is 5,300 to 6,000 feet. The average annual precipitation is 10 to 12 inches, the mean annual air temperature is 47 to 50 degrees F, and the average freeze-free season is 90 to 140 days.

This unit is 45 percent Redbank family soils, 0 to 3 percent slopes, and 45 percent Flatnose family soils, cool, 0 to 8 percent slopes. The Redbank family soils are on the higher river terraces, and the Flatnose family soils are on the lower river terraces.

Included in this unit are 5 percent areas of unstabilized sandy and gravelly sediment that is reworked by streams so frequently that it supports little if any vegetation and 5 percent very deep, very cobbly and very gravelly soils along stream channels.

The Redbank family soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone and shale. The present vegetation in most areas is greasewood, cheatgrass, and green rabbitbrush. No single profile of these soils is typical, but one commonly observed in the survey area has a surface layer of brown sandy clay loam 2 inches thick. The next layer is brown fine sandy loam 30 inches thick. The upper 8 inches of the underlying material is brown fine sandy loam, the next 7 inches is brown loam, and the lower part to a depth of 60 inches or more is brown sandy loam.

Permeability of this Redbank family soil is moderately rapid. Available water capacity is 3 to 10 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. These soils are subject to rare, very brief periods of flooding in April through September.

The Flatnose family soils are very deep and well drained. They formed in alluvium derived dominantly from sandstone and shale. The present vegetation in most areas is basin big sagebrush and Indian ricegrass. No single profile of these soils is typical, but one commonly observed in the survey area has 24 percent of the surface covered with rock fragments, of which 15 percent is pebbles, 5 percent is channery fragments, 3 percent is stones, and 1 percent is boulders. The surface layer is light brownish gray bouldery very fine sandy loam 6 inches thick. The next layer is light brownish gray gravelly silt loam 9 inches thick. The upper 13 inches of the underlying material is light yellowish brown cobbly very fine sandy loam, the next 6 inches is light yellowish brown fine sandy loam, the 10 inches is light brownish gray very gravelly loam, and the lower part to a depth of 60 inches or more is light brownish gray very channery fine sandy loam.

Permeability of this Flatnose family soil is moderate or moderately rapid. Available water capacity is 6.5 to 7.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. These soils are subject to occasional, very brief periods of flooding in April through September.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Redbank family soils is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are alkali sacaton, galleta, seepweed, and black greasewood.

The potential plant community on the Flatnose family soils is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are basin wildrye, western wheatgrass, basin big sagebrush, and rubber rabbitbrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the desirable forage plants are depleted, brush management and rangeland seeding can be used to improve the rangeland vegetation. Suitable brush management practices include

prescribed burning and chemical and mechanical treatment.

The suitability of this unit for rangeland seeding is fair. The main limitation is the content of alkali in the soils. Plants suitable for seeding include native plants and Russian wildrye, crested wheatgrass, and ladak alfalfa.

This map unit is in capability subclass VIc. The Redbank family soils are in Alkali Flat range site, and the Flatnose family soils are in Loamy Bottom range site.

49—Reva-Falcon families-Rock outcrop complex. This map unit is on canyonsides and mountainsides throughout the Book Cliffs area. Slopes are 50 to 80 percent. They are convex and less than 25 feet long. The present vegetation in most areas is pinyon, Douglas-fir, curlleaf mountainmahogany, and Utah juniper. Elevation is 5,900 to 8,600 feet. The average annual precipitation is 12 to 16 inches, the mean annual air temperature is 39 to 44 degrees F, and the average freeze-free season is 60 to 110 days.

This unit is 50 percent Reva family soils, 20 percent Falcon family soils, and 10 percent Rock outcrop that occurs as ledges. The Reva family soils support pinyon, and the Falcon family soils support Douglas-fir. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 5 percent deep, dark-colored, loamy soils that are on north aspects and support Douglas fir; 5 percent shallow, loamy soils that are on narrow benches and ledges and support pinyon, Utah juniper, birchleaf mountainmahogany, and Mexican cliffrose; 5 percent very deep, dark-colored, loamy soils that are in drainageways and support Gambel oak, Woods rose, narrowleaf cottonwood, and common dandelion; and 5 percent very deep, loamy soils that are on benches and foot slopes and support basin big sagebrush.

The Reva family soils are very shallow and shallow and are well drained. They formed in residuum and colluvium derived dominantly from sandstone. No single profile of these soils is typical, but one commonly observed in the survey area has 27 percent of the surface covered with rock fragments, of which 5 percent is channery fragments, 15 percent is pebbles, 5 percent is stones, and 2 percent is boulders. The surface layer is light yellowish brown very bouldery sandy loam 2 inches thick. The next layer is yellowish brown fine sandy loam 2 inches thick. The underlying material to a depth of 8 inches is light yellowish brown extremely channery sandy loam over sandstone. Bedrock is at a depth of 3 to 20 inches.

Permeability of this Reva family soil is moderately rapid. Available water capacity is less than 2.5 inches. Water supplying capacity is 1.0 to 4.5 inches. Effective rooting depth is 3 to 20 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The Falcon family soils are very shallow and shallow and are well drained. They formed in colluvium and residuum derived dominantly from sandstone. No single profile of these soils is typical, but one commonly observed in the survey area has a 2-inch-thick layer of partially decomposed organic material on the surface. The surface layer is brown extremely bouldery sandy loam 2 inches thick. The next layer is brown sandy loam 5 inches thick. The underlying material to a depth of 19 inches is brown gravelly sandy loam over sandstone.

Permeability of this Falcon family soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is 1.0 to 4.5 inches. Effective rooting depth is 3 to 20 inches. The organic matter content of the surface layer is 3 to 5 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used as woodland and wildlife habitat.

The potential plant community on this unit consists of an overstory of pinyon, Utah juniper, and Douglas-fir with a canopy of 50 percent. The understory vegetation is 10 percent grass, 15 percent forbs, and 75 percent shrubs. Important plants are curlleaf mountainmahogany, Utah serviceberry, bluegrass, and Gambel oak.

This unit is limited for use by livestock because of the steepness of slope, the areas of Rock outcrop, and low annual precipitation. The main limitations for seeding are steepness of slope, the bouldery surface layer, restricted soil depth, and low available water capacity.

The site index for pinyon and Utah juniper on this unit is 37. The average yield is about 6 cords of wood per acre. The potential is poor for post or Christmas tree production. The main limitations for harvesting wood products are steepness of slope, restricted soil depth, and the areas of Rock outcrop.

This map unit is in capability subclass VIIe and in Upland Very Steep Shallow Loam (Pinyon-Utah Juniper) range site.

50—Riverwash. This map unit consists of unstabilized sediment that is washed and reworked by water so frequently that it supports little if any vegetation. The sediment is mainly sandy, gravelly, and cobbly material, but some silty and clayey material is also present.

51—Rizno-Begay complex. This map unit is on structural benches and cuestas in areas between the Colorado and Green Rivers. Slope is 2 to 10 percent. Elevation is 4,700 to 6,000 feet. The average annual precipitation is about 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 140 to 170 days.

This unit is 50 percent Rizno fine sandy loam and 25 percent Begay fine sandy loam. The Rizno soil is on ridges and in areas adjacent to Rock outcrop, and the Begay soil is in concave and convex, open areas. The

components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent moderately deep, loamy soils near the edges of cuestas and benches; 10 percent Rizno soils that have slopes of more than 10 percent; and 5 percent Rock outcrop that occurs as ledges.

The Rizno soil is very shallow and shallow and is well drained. It formed in residual and eolian material derived dominantly from sandstone. Slope ranges from 2 to 10 percent. Slopes are convex and less than 75 feet long. The present vegetation in most areas is blackbrush, Mormon-tea, Utah juniper, and pinyon. Typically, the surface layer is light red fine sandy loam about 2 inches thick. The underlying material to a depth of 8 inches is red gravelly fine sandy loam over sandstone. Depth to sandstone ranges from 4 to 20 inches.

Permeability of the Rizno soil is moderately rapid. Available water capacity is less than 2.5 inches. The water supplying capacity is 1 to 3 inches. Effective rooting depth is 4 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Begay soil is very deep and well drained. It formed in eolian and alluvial material derived dominantly from sandstone. Slope ranges from 2 to 10 percent but commonly is 2 to 5 percent. Slopes commonly are 100 to 300 feet long. The present vegetation in most areas is galleta, Indian ricegrass, Mormon-tea, and needleandthread. Typically, the surface layer is yellowish red fine sandy loam about 5 inches thick. The subsoil is yellowish red fine sandy loam about 21 inches thick. The upper 11 inches of the substratum is reddish yellow fine sandy loam, and the lower part to a depth of 60 inches or more is light reddish brown fine sandy loam.

Permeability of the Begay soil is moderately rapid. Available water capacity is about 6.5 to 9.5 inches. Water supplying capacity is 5.0 to 6.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 2 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas. It also can be used as a source of Utah juniper firewood and small amounts of pinyon wood products.

The potential vegetation on Rizno soil is an overstory of Utah juniper and pinyon with a canopy of 15 percent. The understory vegetation is 20 percent grasses, 15 percent forbs, and 65 percent shrubs. Important plants are blackbrush, bluegrass, galleta, Indian ricegrass, and Mormon-tea.

The potential plant community on Begay soil is 60 percent grasses, 15 percent forbs, and 25 percent shrubs. Important plants are needleandthread, Indian ricegrass, and fourwing saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

It is not practical to revegetate large areas of this unit because of the restricted soil depth, competition from Utah juniper and pinyon, and low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

The site index for Utah juniper and pinyon on the Rizno soil is 40. Average yield is 4.5 cords of wood per acre. The potential is poor for post or Christmas tree production.

This map unit is in capability subclass VIIs. The Rizno soil is in Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon) range site, and the Begay soil is in Semidesert Sandy Loam range site.

52—Rizno-Rock outcrop complex. This map unit is on the edges of cuestas and structural benches in the southern part of the survey area (fig. 3). It is between the Green and Colorado Rivers and in the Book Cliffs, west of Crescent Junction. Slope is 2 to 10 percent. Elevation is 4,700 to 6,400 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 47 to 54 degrees F, and the average freeze-free period is 110 to 160 days.

This unit is 50 percent Rizno fine sandy loam, 2 to 10 percent slopes, and 25 percent Rock outcrop. The Rizno soil is in concave areas, and the Rock outcrop is intermingled with areas of the Rizno soil. In some mapped areas in the Book Cliffs, the percentage of Rock outcrop is about the same as that of the Rizno soil. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Rizno soils in the steeper areas, 10 percent loamy, moderately deep soils that are in concave areas and support blackbrush, and 5 percent very deep, sandy soils that are in areas where windblown sediment has accumulated and support sand sagebrush.

The Rizno soil is very shallow and shallow and is well drained. It formed in residual and eolian material derived dominantly from sandstone. Slopes are concave and 50 to 100 feet long. The present vegetation in most areas is blackbrush, Mormon-tea, Utah juniper, and pinyon. Typically, the surface layer is light red fine sandy loam 2 inches thick. The underlying material to a depth of 8 inches is red gravelly fine sandy loam over sandstone. Depth to sandstone ranges from 4 to 20 inches. In the Book Cliffs, the soil generally is yellower in color than is typical.

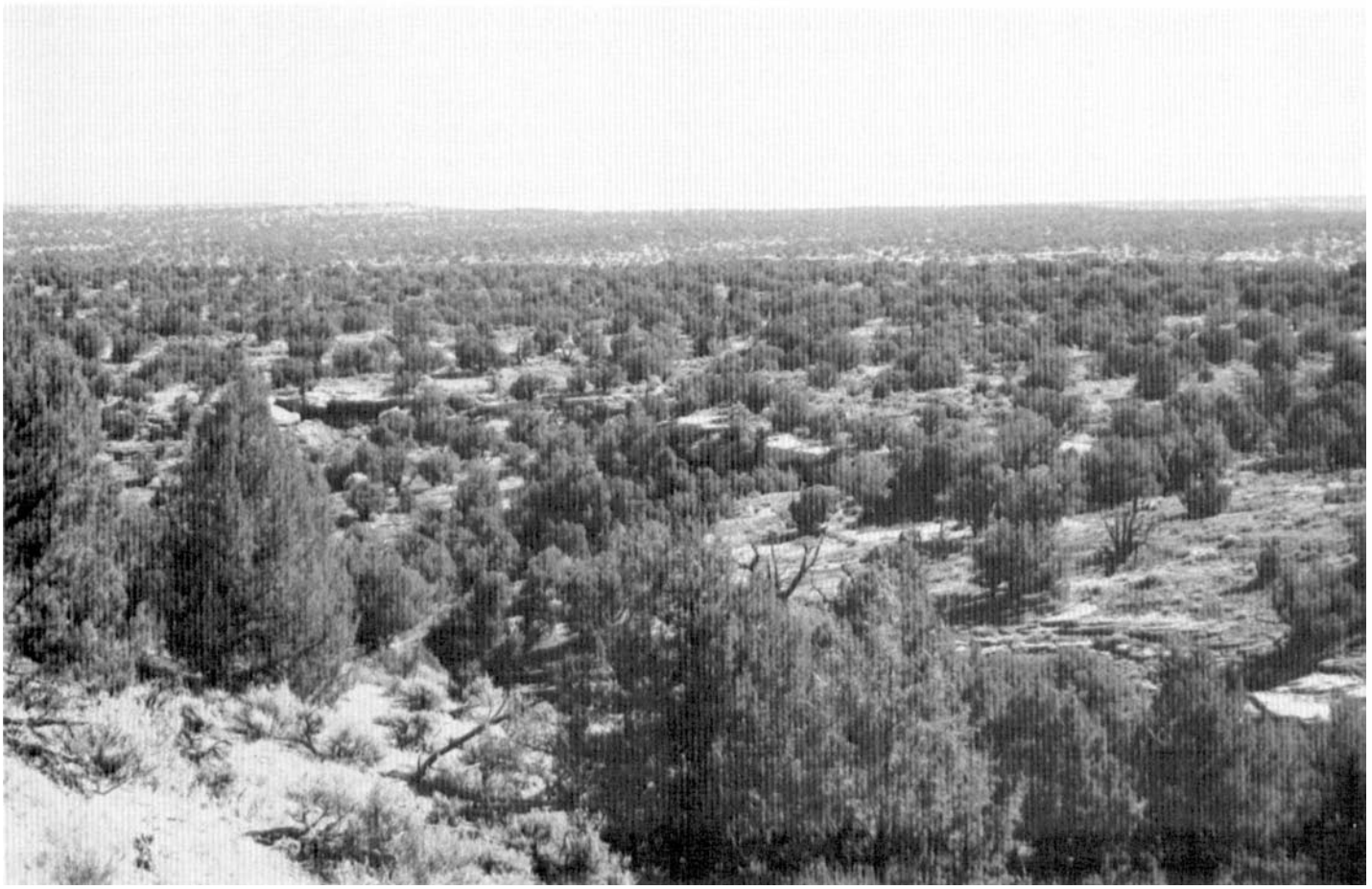


Figure 3.—Area of Rizno-Rock outcrop complex.

Permeability of the Rizno soil is moderately rapid. Available water capacity is less than 2.5 inches. Water supplying capacity is 1 to 3 inches. Effective rooting depth is 4 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Rock outcrop occurs as slickrock, ledges, and monoliths. Sparse vegetation is in the cracks and fissures in the rock.

This unit is used as rangeland, wildlife habitat, and recreation areas. It can be used as a source of Utah juniper firewood and small amounts of pinyon wood products.

The potential vegetation on Rizno soil is an overstory of Utah juniper and pinyon with a canopy of 15 percent. The understory vegetation is 20 percent grasses, 15 percent forbs, and 65 percent shrubs. Important plants are blackbrush, bluegrass, galleta, Indian ricegrass, and Mormon-tea.

The site index for Utah juniper and pinyon on the Rizno soil is 40. Average yield is 4.5 cords of wood per acre. The potential is poor for post or Christmas tree production.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

It is not practical to revegetate large areas of this unit because of the restricted soil depth, competition from Utah juniper and pinyon, and low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Rizno soil is in Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon) range site.

53—Rock outcrop. This map unit is on structural benches, cuestas, and ridges. The unit is dominantly massive sandstone slickrock areas that are dissected by crevices. Some ledges and monoliths are also present. The present vegetation in most areas is Utah juniper and singleleaf ash at the lower elevations, and it is Utah juniper and pinyon at elevations above about 4,700 feet. The vegetation is very sparse.

This unit is used for wildlife habitat and recreation areas.

54—Rock outcrop-Arches-Mido complex. This map unit is on cuestas and structural benches and in areas around monoliths. It is in the southern part of the survey area. Slope is 2 to 20 percent. Elevation is 4,700 to 6,000 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free period is 140 to 170 days.

This unit is 35 percent Rock outcrop; 35 percent Arches loamy fine sand, 2 to 20 percent slopes; and 20 percent Mido loamy fine sand, 2 to 20 percent slopes. The Arches soil is throughout the unit between areas of Rock outcrop, and the Mido soil is in small basins and depressional areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 5 percent shallow, loamy soils that are on ledges and support Utah juniper and 5 percent moderately deep, loamy soils that are on foot slopes and support fourwing saltbush and Indian ricegrass.

Rock outcrop is barren exposures of sandstone. It occurs as ledges, monoliths, and slickrock.

The Arches soil is shallow and well drained. It formed in eolian material derived dominantly from sandstone. Slope ranges from 2 to 20 percent but commonly is 2 to 10 percent. Slopes are convex and less than 50 feet long. The present vegetation in most areas is blackbrush, Mormon-tea, galleta, and singleleaf ash. Typically, the surface layer is yellowish red loamy fine sand 2 inches thick. The underlying material to a depth of 16 inches is yellowish red loamy fine sand. Sandstone is at a depth of 16 inches. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Arches soil is rapid. Available water capacity is less than 2 inches. Water supplying capacity is less than 3 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is severe.

The Mido soil is very deep and excessively drained. It formed in eolian material derived dominantly from sandstone. Slope ranges from 2 to 20 percent but commonly is less than 10 percent. Slopes are concave to convex and less than 75 feet long. The present vegetation in most areas is Nevada Mormon-tea, Indian ricegrass, sandhill muhly, galleta, sand sagebrush, and wavyleaf oak. Typically, the surface layer is reddish yellow loamy fine sand 7 inches thick. Below this to a depth of 60 inches or more is reddish yellow loamy fine sand. Sandstone is at a depth of 60 inches or more.

Permeability of the Mido soil is rapid. Available water capacity is 3.0 to 5.5 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is about 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential vegetation on the Arches soil is an overstory of Utah juniper and pinyon with a canopy of 15 percent. The understory vegetation is 20 percent grasses, 15 percent forbs, and 65 percent shrubs. Important plants are blackbrush, bluegrass, galleta, Indian ricegrass, and Mormon-tea.

The potential plant community on Mido soil is 50 percent grasses, 15 percent forbs, and 35 percent shrubs. Important plants are Indian ricegrass, Mormon-tea, dropseed, fourwing saltbush, and sandhill muhly.

It is not practical to revegetate large areas of this unit because of the restricted soil depth, competition from Utah juniper and pinyon, the hazard of soil blowing, and low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

The site index for Utah juniper and pinyon on the Arches soil is 40. Average yield is 4.5 cords of wood per acre. The potential is poor for post or Christmas tree production.

This map unit is in capability subclass VIIe. The Arches soil is in Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon) range site, and the Mido soil is in Semidesert Sand range site.

55—Rock outcrop-Moenkopie association. This map unit is on toe slopes of mesas, cuestas, and structural benches south of the Book Cliffs. Slope is 3 to 20 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is 60 percent Rock outcrop and 25 percent Moenkopie fine sandy loam, 3 to 20 percent slopes. Rock outcrop occurs mostly as slickrock and ledges, and the Moenkopie soil is intermingled with the areas of Rock outcrop.

Included in this unit are about 10 percent moderately deep, loamy soils and 5 percent deep, loamy soils. These soils support Indian ricegrass, Mormon-tea, and

galleta and are generally at the base of slopes or in concave areas.

Rock outcrop occurs mostly as areas of slickrock and ledges on side slopes and margins of cuestas and benches. In some areas scattered Utah juniper and singleleaf ash are in the crevices of the rock.

The Moenkopie soil is very shallow and shallow and is well drained. It formed in eolian and residual material derived dominantly from sandstone. Slope ranges from 3 to 20 percent but commonly is more than 10 percent. Slopes generally are 25 to 50 feet long. The present vegetation in most areas is blackbrush, galleta, Mormon-tea, and Indian ricegrass. In some areas scattered singleleaf ash and Utah juniper are near the areas of Rock outcrop. Typically, the surface layer is light reddish brown fine sandy loam about 2 inches thick. The upper 14 inches of the underlying material is light reddish brown sandy loam, and the lower part to a depth of 19 inches is light reddish brown sandy loam. Sandstone is at a depth of 19 inches. Depth to sandstone ranges from 5 to 20 inches.

Permeability of the Moenkopie soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is less than 2.5 inches. Effective rooting depth is 5 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Moenkopie soil is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and blackbrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and restricted soil depth. For critical erosion control, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability class VIII. The Moenkopie soil is in Desert Shallow Sandy Loam range site.

56—Sagers silt loam. This very deep, well drained soil is on valley floors and plains. It is north and west of Arches National Park, below the Book Cliffs. It formed in alluvium derived dominantly from marine shale. Slopes are 1 to 3 percent, concave, and 100 to 200 feet long. The present vegetation in most areas is wedgeleaf saltbush, galleta, Indian ricegrass, and bottlebrush squirreltail. Elevation is 4,500 to 4,800 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

Typically, the surface layer is pale brown silt loam 8 inches thick. The underlying material to a depth of 60 inches or more is pale brown and light brownish gray silty clay loam.

Included in this unit are about 15 percent moderately deep, silty soils and 10 percent shallow, clayey soils in concave areas.

Permeability of the Sagers soil is moderately slow. Available water capacity is 9 to 11 inches. Water supplying capacity is 3.5 to 5.0 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Sagers soil is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and low water supplying capacity of the soil. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe and in Desert Clay range site.

57—Sandoval-Strych complex. This map unit is on alluvial fans and shale pediments below the Book Cliffs. Slope is 1 to 15 percent slopes. Elevation is 5,200 to 5,900 feet. The average annual precipitation is 9 to 12 inches, the mean annual air temperature is 46 to 50 degrees F, and the average freeze-free season is 100 to 140 days.

This unit is 45 percent Sandoval silt loam, 3 to 15 percent slopes, on the shale pediments; and 25 percent Strych fine sandy loam, 1 to 8 percent slopes, on the fans mantling the pediments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent moderately deep, loamy soils that are on the steeper upper part of fans and support Salina wildrye; 5 percent moderately deep, silty soils that are at the bottom of fans and

support wedgeleaf saltbush; 5 percent very shallow, clayey soils that are on shale pediments and support mat saltbush; and 5 percent very deep, loamy soils that are in drainageways and support black greasewood and basin big sagebrush.

The Sandoval soil is shallow and well drained. It formed in residuum and alluvium derived dominantly from shale. Slopes are generally convex and less than 50 feet long. The present vegetation in most areas is galleta, Salina wildrye, shadscale, and some wedgeleaf saltbush. Typically, the surface layer is light brownish gray silt loam 2 inches thick. Below this to a depth of 18 inches is light brownish gray silt loam over weathered shale. Depth to weathered shale is 10 to 20 inches.

Permeability of the Sandoval soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The Strych soil is very deep and well drained. It formed in alluvium derived dominantly from sandstone and conglomerate. Slopes are concave to convex and less than 50 feet long. The present vegetation in most areas is Utah juniper, pinyon, Salina wildrye, and galleta. Typically, 5 percent of the surface is covered with stones and 10 percent is covered with pebbles. The surface layer is yellowish brown fine sandy loam 1 inch thick. The upper 5 inches of subsoil is brown fine sandy loam, and the lower 5 inches is pale brown stony loam. The upper 37 inches of the substratum is pale brown very stony loam, and the lower part to a depth of more than 60 inches or more is light yellowish brown stony sandy loam.

Permeability of the Strych soil is moderately rapid. Available water capacity is 4.0 to 7.5 inches. Water supplying capacity is 4 to 7 inches. Effective rooting depth is 60 inches or more. Organic matter content of the surface layer is 1 to 3 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Sandoval soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Salina wildrye, shadscale, broom snakeweed, and green rabbitbrush.

Management practices that maintain or improve the rangeland vegetation on this soil include proper grazing use, planned grazing systems, and proper location of livestock watering developments. The suitability of the soil for rangeland seeding is poor. The main limitations are restricted soil depth and low annual precipitation.

The potential vegetation on the Strych soil is an overstory of Utah juniper and pinyon with a canopy of 25 percent. The understory vegetation is 35 percent grasses, 15 percent forbs, and 50 percent shrubs. Important plants are Utah juniper, Salina wildrye, Indian ricegrass, and needleandthread.

The site index for Utah juniper and pinyon on this soil is 40. Average yield is 6 cords of wood per acre. The potential is good for post or Christmas tree production. The suitability of this unit for harvesting wood products is fair.

Management practices that maintain or improve the rangeland vegetation on this soil include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If Utah juniper and pinyon are thinned, desirable plant species present will increase for a short period of time. Then Utah juniper and pinyon re-occupy the site.

The suitability of this soil for rangeland seeding is poor. The main limitations are rock fragments on and in the soil and low annual precipitation.

This map unit is in capability subclass VIIe. The Sandoval soil is in Semidesert Shallow Loam (Salina Wildrye) range site, and the Strych soil is in Semidesert Stony Loam (Juniper-Pinyon) range site.

58—Sandoval-Killpack complex. This map unit is on broad shale pediments and hills below the Book Cliffs. It is in the east-central part of the survey area, east of Nash Wash. Slope is 3 to 25 percent. Elevation is 4,700 to 5,300 feet. The average annual precipitation is 7 to 11 inches, the mean annual air temperature is 49 to 53 degrees F, and the average freeze-free season is 130 to 160 days.

This unit is about 40 percent Sandoval silt loam, 3 to 15 percent slopes, on ridgelines and broad north- and east-facing side slopes, and 25 percent Killpack silty clay loam, 10 to 25 percent slopes, on back slopes and slope breaks. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent moderately deep, loamy soils that are on steep back slopes and support Salina wildrye; 10 percent very shallow, clayey soils that are on south-facing nose slopes and the upper part of slopes and support mat saltbush; 5 percent very deep, loamy soils that are in drainageways and support black greasewood; 5 percent shallow, loamy soils that are near the rims of cuestas and support Wyoming big sagebrush, shadscale, Indian ricegrass, and scattered Utah juniper, black sagebrush, and fourwing saltbush; and 5 percent very deep, loamy soils that are in concave areas and support Wyoming big sagebrush.

The Sandoval soil is shallow and well drained. It formed in residuum and alluvium derived dominantly from marine shale. Slopes are concave to convex and are generally less than 50 feet long. The present vegetation in most areas is wedgeleaf saltbush, Salina wildrye, shadscale, and galleta. Typically, the surface layer is light brownish gray silt loam about 2 inches thick. Below

this to a depth of 18 inches is light brownish gray silt loam over weathered shale. Depth to shale ranges from 10 to 20 inches.

Permeability of the Sandoval soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The Killpack soil is moderately deep and well drained. It formed in residuum and colluvium derived dominantly from shale. Slopes are smooth to concave and generally less than 25 feet long. The present vegetation in most areas is wedgeleaf saltbush, galleta, and some mat saltbush. Typically, the surface layer is very pale brown silty clay loam 4 inches thick. The upper 12 inches of the underlying material is pale brown silty clay loam, the next 7 inches is pale brown silt loam, and the lower part to a depth of 36 inches is very pale brown silty clay loam. Gypsiferous shale is at a depth of 36 inches. Depth to partially weathered shale ranges from 20 to 40 inches.

Permeability of the Killpack soil is moderately slow. Available water capacity is 4.5 to 7.0 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Sandoval soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Salina wildrye, shadscale, broom snakeweed, and green rabbitbrush.

The potential plant community on the Killpack soil is 30 percent grasses, 15 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, wedgeleaf saltbush, and bud sagebrush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

The suitability of this unit for rangeland seeding is poor. The main limitations are restricted soil depth and the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIe. The Sandoval soil is in Semidesert Shallow Loam (Salina Wildrye) range site, and the Killpack soil is in Desert Clay range site.

59—Sandoval-Thedalund family complex. This map unit is on remnants of shale pediments below the Book Cliffs, from Nash Wash to the Colorado state line. Slope is 3 to 30 percent. Elevation is 4,900 to 5,500 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 47 to 51 degrees F, and the average freeze-free season is 130 to 150 days.

This unit is about 30 percent Sandoval silt loam, 3 to 15 percent slopes, on the remnants of shale pediments and 25 percent Thedalund family soils, 3 to 30 percent slopes, on side slopes.

Included in this unit are 15 percent moderately deep, loamy soils that are on steep back slopes and support Salina wildrye; 15 percent very shallow, clayey soils that are on lower shale pediments and support mat saltbush; 5 percent shallow, loamy soils that are on sandstone benches and support Utah juniper; 5 percent Badland; and 5 percent very deep, loamy soils that are in drainageways and support basin big sagebrush and black greasewood.

The Sandoval soil is shallow and well drained. It formed in residuum and alluvium derived dominantly from marine shale. Slopes are generally convex and less than 50 feet long. The present vegetation in most areas is galleta, Salina wildrye, shadscale, and some wedgeleaf saltbush. Typically, the surface layer is light brownish gray silt loam about 2 inches thick. Below this to a depth of 18 inches is light brownish gray silt loam over weathered shale. Depth to weathered shale is 10 to 20 inches.

Permeability of the Sandoval soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The Thedalund family soils are moderately deep and well drained. They formed in colluvium and residuum derived dominantly from shale. Slope ranges from 3 to 30 percent but is generally more than 7 percent. Slopes are convex to concave and less than 25 feet long. The present vegetation in most areas is Wyoming big sagebrush, shadscale, and Salina wildrye. No single profile of the Thedalund family soils is typical, but one commonly observed in the survey area has 61 percent of the surface covered with rock fragments, of which 35 percent is channery fragments, 25 percent is pebbles, and 1 percent is flagstones of sandstone. The surface layer is light yellowish brown very channery loam 2 inches thick. The upper 3 inches of underlying material is light yellowish brown clay loam, and the lower part to a depth of 27 inches is light brownish gray silty clay loam over weathered shale. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of this Thedalund family soil is moderately slow. Available water capacity is about 2.5 to 7.0 inches. Water supplying capacity is 2.5 to 6.0 inches. Effective rooting depth is 20 to 40 inches. The organic matter

content of the surface layer is about 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Sandoval soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Salina wildrye, shadscale, broom snakeweed, and green rabbitbrush.

The potential plant community on the Thedalund family soils is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Wyoming big sagebrush, Indian ricegrass, galleta, and winterfat.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

The suitability of this unit for rangeland seeding is poor. The main limitations are restricted soil depth and the low annual precipitation.

This map unit is in capability subclass VIIe. The Sandoval soil is in Semidesert Shallow Loam (Salina Wildrye) range site, and the Thedalund family soils are in Semidesert Gravelly Loam (Wyoming Big Sagebrush) range site.

60—Sazi fine sandy loam, 3 to 8 percent slopes. This moderately deep, well drained soil is on structural benches and broad cuestas east of Horse Canyon, in the Book Cliffs. It formed in alluvium derived dominantly from sandstone. Slopes are smooth to convex, 50 to 100 feet long, and dominantly on north aspects. The present vegetation in most areas is Wyoming big sagebrush, broom snakeweed, galleta, and Indian ricegrass. Elevation is 5,100 to 5,600 feet. The average annual precipitation is 9 to 12 inches, the mean annual air temperature is 48 to 51 degrees F, and the average freeze-free season is 120 to 140 days.

Typically, the surface layer is light brown fine sandy loam 1 inch thick. The subsoil is light brown fine sandy loam 4 inches thick. The upper 7 inches of the substratum is pink very fine sandy loam, the next 8 inches is pink fine sandy loam, and the lower part to a depth of 27 inches is light brown fine sandy loam. Sandstone is at a depth of 27 inches. Depth to sandstone ranges from 20 to 40 inches.

Included in this unit are 15 percent very deep, loamy soils that have an accumulation of carbonates, are intermingled with areas of this Sazi soil, and support the same type of vegetation as that on the Sazi soil; 10 percent shallow, loamy soils that are in the higher lying areas and support Utah juniper and Wyoming big sagebrush; and 5 percent very deep, very stony soils that are near drainageways and support Utah juniper.

Permeability of the Sazi soil is moderately rapid. Available water capacity is 2.5 to 6.0 inches. Water supplying capacity is 3.0 to 5.5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Sazi soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Indian ricegrass, galleta, Wyoming big sagebrush, and winterfat. In areas where a large percentage of the potential plant community has been removed, Utah juniper and pinyon may invade.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the desirable forage plants are depleted, brush management and rangeland seeding can be used to improve the rangeland vegetation. Suitable brush management practices include prescribed burning and chemical and mechanical treatment.

The suitability of this unit for rangeland seeding is fair. The main limitation is the low annual precipitation. Plants suitable for seeding include plants native to the unit and crested wheatgrass, ladak alfalfa, and prostrate kochia.

This map unit is in capability subclass VIIe and in Semidesert Loam (Wyoming Big Sagebrush) range site.

61—Sazi-Shalako-Mido complex. This map unit is on structural benches east of Cisco and south of Interstate 70 above Westwater Canyon, on the Colorado River. Slope is 2 to 20 percent. Elevation is 4,700 to 5,100 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 50 to 54 degrees F, and the average freeze-free season is 140 to 160 days.

This unit is about 30 percent Sazi fine sandy loam, 3 to 8 percent slopes; 30 percent Shalako gravelly sandy loam, dry, 3 to 8 percent slopes; and 20 percent Mido loamy fine sand, 2 to 20 percent slopes. The Sazi and Mido soils are on side slopes and in concave areas, and the Shalako soils are on ridges and near the edges of escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent Rock outcrop that is at the edge of escarpments and in drainageways and occurs as slickrock; 5 percent shallow, loamy soils that are intermingled with areas of the Shalako soils near the bottom of south-facing side slopes and support shadscale; and 5 percent shallow, sandy soils that are on north-facing ridges and support blackbrush.

The Sazi soil is moderately deep and well drained. It formed in alluvial and eolian material derived dominantly from sandstone. Slopes are concave, 25 to 50 feet long, and generally face north. The present vegetation in most areas is Wyoming big sagebrush, galleta, and Indian ricegrass. Typically, the surface layer is light brown fine

sandy loam about 1 inch thick. The subsoil is light brown fine sandy loam 4 inches thick. The upper 7 inches of substratum is pink very fine sandy loam, the next 8 inches is pink fine sandy loam, and the lower part to a depth of 27 inches is light brown fine sandy loam. Sandstone is at a depth of 27 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Sazi soil is moderately rapid. Available water capacity is 2.5 to 6.0 inches. Water supplying capacity is 3.0 to 5.5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Shalako soil is shallow and well drained. It formed in residuum and alluvium derived dominantly from sandstone. Slopes are convex and generally less than 25 feet long. The present vegetation in most areas is Utah juniper, shadscale, black sagebrush, and green rabbitbrush. Typically, 15 percent of the surface is covered with channery fragments and 30 percent is covered with pebbles. The surface layer is light yellowish brown gravelly sandy loam about 1 inch thick. The subsoil is light yellowish brown fine sandy loam 3 inches thick. The substratum to a depth of 10 inches is very pale brown gravelly loam over sandstone. Depth to sandstone ranges from 10 to 20 inches.

Permeability of the Shalako soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Mido soil is very deep and excessively drained. It formed in eolian material derived dominantly from sandstone. Slopes are concave to convex and less than 75 feet long. The present vegetation in most areas is Nevada Mormon-tea, Indian ricegrass, sandhill muhly, galleta, and sand sagebrush. Typically, the surface layer is reddish yellow loamy fine sand about 7 inches thick. Below this to a depth of 60 inches or more is reddish yellow loamy fine sand. °Sandstone is at a depth of 60 inches or more.

Permeability of the Mido soil is rapid. Available water capacity is 3.0 to 5.5 inches. Water supplying capacity is 3 to 6 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is about 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Sazi soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Indian ricegrass, galleta, Wyoming big sagebrush, and winterfat. In areas where a large percentage of the potential plant community has been removed, Utah juniper and pinyon may invade.

The potential vegetation on the Shalako soil is an overstory of Utah juniper and pinyon with a canopy of 30 percent. The understory vegetation is 15 percent grasses, 5 percent forbs, and 80 percent shrubs. Important plants are birchleaf mountainmahogany, black sagebrush, Salina wildrye, and Utah juniper.

The potential plant community on Mido soil is 50 percent grasses, 15 percent forbs, and 35 percent shrubs. Important plants are Indian ricegrass, Mormon-tea, dropseed, fourwing saltbush, and sandhill muhly.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the desirable forage plants are depleted, chemical spraying and seeding can be used to improve the rangeland vegetation. It is desirable to apply improvement practices that cause the least amount of soil disturbance because of the hazard of soil blowing.

The suitability of this unit for rangeland seeding is poor. The main limitations are restricted soil depth, the hazard of soil blowing, and low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants suitable for seeding include fourwing saltbush, Indian ricegrass, sand dropseed, crested wheatgrass, ladak alfalfa, prostrate kochia, and other native plants.

The site index for Utah juniper and pinyon on the Shalako soil is 40. Average yield is 6 cords of wood per acre. The potential is good for post or Christmas tree production.

This map unit is in capability subclass VIIe. The Sazi soil is in Semidesert Loam (Wyoming Big Sagebrush) range site, the Shalako soil is in Semidesert Shallow Loam (Utah Juniper-Pinyon) range site, and the Mido soil is in Semidesert Sand range site.

62—Shalako gravelly sandy loam, 3 to 8 percent slopes. This shallow, well drained soil is on cuesta dip slopes and structural benches. It is dominantly east of Cottonwood Canyon, along the base of the Book Cliffs. It formed in a thin mantle of alluvium over residuum derived dominantly from sandstone. Slopes are convex, less than 100 feet long, and on north aspects. The present vegetation in most areas is Utah juniper, shadscale, black sagebrush, and green rabbitbrush. Elevation is 5,100 to 6,100 feet. The average annual precipitation is 10 to 12 inches, the mean annual air temperature is 46 to 50 degrees F, and the average freeze-free season is 100 to 140 days.

Typically, 15 percent of the surface is covered with channery fragments and 30 percent is covered with pebbles. The surface layer is light yellowish brown gravelly sandy loam about 1 inch thick. The subsoil is light yellowish brown fine sandy loam 3 inches thick. The

substratum to a depth of 10 inches is very pale brown gravelly loam over sandstone. Depth to sandstone ranges from 10 to 20 inches.

Included in this unit are 10 percent moderately deep, loamy soils that are in concave areas and support Wyoming big sagebrush; 10 percent moderately deep, clayey soils that are in depressional areas and support Salina wildrye and shadscale; and 5 percent deep, loamy soils that are in depressional areas along drainageways and support Wyoming big sagebrush and fourwing saltbush.

Permeability of the Shalako soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is 2 to 4 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is about 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used as rangeland and wildlife habitat.

The potential vegetation on the Shalako soil is an overstory of Utah juniper and pinyon with a canopy of 30 percent. The understory vegetation is 15 percent grasses, 5 percent forbs, and 80 percent shrubs. Important plants are birchleaf mountainmahogany, black sagebrush, Salina wildrye, and Utah juniper.

The site index for Utah juniper and pinyon is 40. Average yield is 6 cords of wood per acre. The potential is good for post or Christmas tree production.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

It is not practical to revegetate large areas of this unit because of the restricted soil depth. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that are suitable for seeding in these areas are adapted native plants, crested wheatgrass, and ladak alfalfa. If Utah juniper and pinyon are thinned, desirable plant species present can be expected to increase for a short period of time before the Utah juniper and pinyon re-occupy the areas.

This map unit is in capability subclass VIIs and in Semidesert Shallow Loam (Utah Juniper-Pinyon) range site.

63—Shalako sandy loam, 3 to 30 percent slopes. This shallow, well drained soil is on structural benches and cuestas throughout the Book Cliffs area. It formed in residuum derived dominantly from sandstone. Slope ranges from 3 to 30 percent but is commonly 3 to 15 percent. Slopes are smooth to concave and are less than 50 feet long. The present vegetation in most areas is pinyon, Utah juniper, Mexican cliffrose, and birchleaf mountainmahogany (fig. 4). Gambel oak is in drainageways and pockets on the eastern part of the survey area, and Mexican cliffrose is scattered throughout the western part of the unit. Elevation is 5,800 to 7,600 feet. The average annual precipitation is 12 to 16 inches, the mean annual air temperature is 45 to 47 degrees F, and the average freeze-free period is 70 to 110 days.

Typically, the surface layer is yellowish brown sandy loam 2 inches thick. The next layer is yellowish brown sandy loam 4 inches thick. The upper 3 inches of the underlying material is brown sandy loam, and the lower part to a depth of 11 inches is brown sandy loam over sandstone. Depth to sandstone ranges from 10 to 20 inches.

Included in this unit are 5 percent very deep, loamy soils that are along drainageways and support basin big sagebrush; 10 percent moderately deep, loamy soils that are in concave areas and support Wyoming big sagebrush; 10 percent Rock outcrop near the edges of benches and cuestas; 5 percent Lockerby soils; and 5 percent moderately deep, loamy soils that are near seeps and support Salina wildrye. The percentage of Rock outcrop is considerably higher in some areas on structural benches east of Hay Canyon.

Permeability of the Shalako soil is moderately rapid. Available water capacity is less than 3 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, woodland, and wildlife habitat.

The potential vegetation on the Shalako soil is an overstory of pinyon and Utah juniper with a canopy of 60 percent. The understory vegetation is 15 percent grasses, 10 percent forbs, and 75 percent shrubs. Important plants are pinyon, Utah juniper, birchleaf mountainmahogany, and Mexican cliffrose.

The site index for pinyon and Utah juniper is 32. Average yield is 4 cords of wood per acre. The potential is poor for post or Christmas tree production.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If pinyon and Utah juniper are thinned, desirable plant species present can be expected to increase for a short period of time before the pinyon and Utah juniper re-occupy the areas.

The suitability of this unit for rangeland seeding is very poor because of the shallow soil depth. It is not practical to revegetate large areas of the unit. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that are suitable for seeding in these areas are adapted native plants, crested wheatgrass, and ladak alfalfa.

This map unit is in capability subclass VIIs and in Upland Shallow Loam (Pinyon-Utah Juniper) range site.

Figure 4.—Native vegetation in an area of Shalako sandy loam, 3 to 30 percent slopes.

64—Shalet loam, 3 to 10 percent slopes. This very shallow and shallow, well drained soil is on structural benches and cuestas west of Arches National Park and east of the Green River. It formed in residuum derived dominantly from interbedded sandstone and shale. Slopes are concave to convex and 100 to 200 feet long. The present vegetation in most areas is mainly galleta, shadscale, Indian ricegrass, and sparse blackbrush. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 55 degrees F, and the average freeze-free season is 150 to 180 days.

Typically, the surface layer is reddish brown loam about 3 inches thick. The underlying material to a depth of 7 inches is reddish brown clay loam over weathered shale. Depth to interbedded shale and sandstone ranges from 5 to 20 inches.

Included in this unit are about 10 percent shallow, loamy soils that support blackbrush and galleta, 5 percent deep, loamy soils that are on steep side slopes and support wedgeleaf saltbush and galleta, and 5 percent Rock outcrop.

Permeability of the Shalet soil is moderately slow. Available water capacity is less than 3.5 inches. Water

supplying capacity is less than 2.5 inches. Effective rooting depth is 5 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Shalet soil is 35 percent grasses, 15 percent forbs, and 50 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and wedgeleaf saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of water developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the restricted soil depth and low annual precipitation. For critical erosion control, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs and in Desert Shallow Loam (Shadscale) range site.

65—Shalet-Nakai complex. This map unit is on gently undulating structural benches in the western part of the survey area, south of Salt Wash and north of Spring Canyon, near the Green River. Slope is 3 to 10 percent. Elevation is 4,000 to 4,400 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 52 to 55 degrees F, and the average freeze-free season is 160 to 180 days.

This unit is about 45 percent Shalet loam on the higher part of benches rimmed by Rock outcrop and 25 percent Nakai fine sandy loam in basins. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 10 percent deep, loamy soils on steep side slopes below areas of Rock outcrop; 5 percent very deep, sandy soils that are associated with the Nakai soils; 5 percent very deep, loamy soils along drainageways; 5 percent Badland; and 5 percent Rock outcrop.

The Shalet soil is very shallow and shallow and is well drained. It formed in residuum derived dominantly from sandstone and shale. Slopes are concave to convex and less than 25 feet long. The present vegetation in most areas is galleta, shadscale, Indian ricegrass, and Mormon-tea. Blackbrush is in some areas. Typically, the surface layer is reddish brown loam about 3 inches thick. The underlying material to a depth of 7 inches is reddish brown clay loam over weathered shale. Depth to interbedded shale and sandstone ranges from 5 to 20 inches.

Permeability of the Shalet soil is moderately slow. Available water capacity is less than 3.5 inches. Water supplying capacity is less than 2.5 inches. Effective rooting depth is 5 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Nakai soil is deep and well drained. It formed in eolian and alluvial material derived dominantly from sandstone. Slopes are convex to concave and generally are 50 to 100 feet long. The present vegetation in most areas is Indian ricegrass, sand dropseed, Mormon-tea, and eriogonum. Typically, the surface layer is light reddish brown fine sandy loam about 3 inches thick. The subsoil is brown fine sandy loam 5 inches thick. The substratum is light reddish brown fine sandy loam 49 inches thick. Sandstone is at a depth of 57 inches. Depth to sandstone ranges from 40 to 60 inches.

Permeability of the Nakai soil is moderately rapid. Available water capacity is 5.0 to 9.5 inches. Water supplying capacity is 2.5 to 5.0 inches. Effective rooting depth is 40 to 60 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Shalet soil is 35 percent grasses, 15 percent forbs, and 50 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and wedgeleaf saltbush.

The potential plant community on the Nakai soil is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Indian ricegrass, fourwing saltbush, and shadscale.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the restricted soil depth and low annual precipitation. For critical erosion control, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Shalet soil is in Desert Shallow Loam (Shadscale) range site, and the Nakai soil is in Desert Sandy Loam range site.

66—Sheppard fine sand, 2 to 10 percent slopes. This very deep, somewhat excessively drained soil is in areas of valley fill and on alluvial fans south of the airport at Moab, along the upper Court House Wash and Seven Mile Canyon. The soil formed in eolian material

derived dominantly from sandstone. Slopes are undulating and less than 50 feet long. The present vegetation in most areas is sand sagebrush, black greasewood, Indian ricegrass, and needleandthread. Elevation is 4,500 to 4,800 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 150 to 170 days.

Typically, the soil is reddish yellow fine sand to a depth of 60 inches or more.

Included in this unit are about 15 percent very deep, loamy soils that are along drainageways and stream channels and support black greasewood; 10 percent deep, loamy soils on structural benches near the edges of mapped areas; and 5 percent Dune land.

Permeability of the Sheppard soil is rapid. Available water capacity is 3.5 to 5.0 inches. Water supplying capacity is 2.5 to 4.0 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is severe.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Sheppard soil is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are Indian ricegrass, galleta, dropseed, and fourwing saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and the hazard of soil blowing. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants.

This map unit is in capability subclass VIIe and in Desert Sand range site.

67—Skylick sandy loam, 8 to 30 percent slopes. This very deep, well drained soil is on mountain foot slopes in the northern part of the survey area. It formed in colluvium derived dominantly from sandstone and shale. Slopes are dominantly convex and 100 to 300 feet long. The present vegetation in most areas is Gambel oak, Wyoming big sagebrush, snowberry, and bluegrass. Elevation is 6,600 to 8,500 feet. The average annual precipitation is 16 to 23 inches, the mean annual air temperature is 37 to 42 degrees F, and the average freeze-free season is 40 to 80 days.

Typically, the surface is covered with 2 inches of undecomposed leaves and twigs overlying 2 inches of decomposed organic matter. The surface layer is dark brown and dark grayish brown sandy loam about 21 inches thick. The upper 9 inches of the subsoil is brown sandy loam, and the lower part to a depth of 60 inches or more is grayish brown and pale brown sandy clay loam.

Included in this unit are 10 percent loamy, shallow soils that are dominantly on benches in the Nutters Hole area and support Wyoming big sagebrush; 5 percent loamy, shallow soils that are on ledges, benches, and ridgelines and support pinyon and Utah juniper; and 5 percent loamy, moderately deep soils that are on the upper part of slopes and support basin big sagebrush.

Permeability of this Skylick soil is moderately slow. Available water capacity is 6.0 to 9.5 inches. Water supplying capacity is 8 to 16 inches. Effective rooting depth is more than 60 inches. The organic matter content of the surface layer is 3 to 5 percent. Runoff is medium and the hazard of water erosion is slight. The hazard of soil blowing is slight.

This unit is used as rangeland and wildlife habitat.

The potential plant community on the Skylick soil is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are Columbia needlegrass, mountain brome, Gambel oak, and Utah serviceberry.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If the desirable forage plants are depleted, brush management and rangeland seeding can be used to improve the rangeland vegetation. Suitable brush management practices include prescribed burning and chemical and mechanical treatment. A combination of burning, spraying, and mechanical treatment can be used to eradicate Gambel oak, but it will re-occupy the area in time.

The suitability of this unit for rangeland seeding is good. The main limitation is plant competition and steepness of slope in some areas. Plants suitable for seeding include adapted native plants and smooth brome, orchardgrass, intermediate wheatgrass, and alfalfa.

This map unit is in capability subclass VIe and in Mountain Loam (Oak) range site.

68—Slickens. This map unit consists of accumulations of tailings from a uranium mill just north of Moab, Utah, and a potash mill near the Colorado River, downstream from Moab. The uranium tailing are finely ground rock that has undergone a carbonate and acid treatment and is pumped and stored as a slurry in holding ponds near the mill. The areas of Slickens near the potash plant consist of highly saline residue from the evaporation ponds or seepage from the mine area.

69—Strych fine sandy loam, 1 to 8 percent slopes. This very deep, well drained soil is on alluvial fans east of Nash Wash. It formed in alluvium derived dominantly

from sandstone and conglomerate. Slopes are convex, less than 50 feet long, and on south aspects. The present vegetation in most areas is mainly Utah juniper, pinyon, Salina wildrye, and galleta. Elevation is 5,200 to 6,200 feet. The average annual precipitation is 10 to 13 inches, the mean annual air temperature is 46 to 50 degrees F, and the average freeze-free season is 100 to 140 days.

Typically, 5 percent of the surface is covered with stones and 10 percent is covered with pebbles. The surface layer is yellowish brown fine sandy loam about 1 inch thick. The upper 5 inches of the subsoil is brown fine sandy loam, and the lower 5 inches is pale brown stony loam. The upper 37 inches of the substratum is pale brown very stony loam, and the lower part to a depth of 60 inches or more is light yellowish brown stony sandy loam.

Included in this unit are 10 percent very deep, loamy soils that are on concave side slopes and the lower part of fans and support basin big sagebrush and 5 percent moderately deep, loamy soils that are on steep sides slopes and support Salina wildrye.

Permeability of this Strych soil is moderately rapid. Available water capacity is 4.0 to 7.5 inches. Water supplying capacity is 4 to 7 inches. Effective rooting depth is 60 inches or more. Organic matter content of the surface layer is 1 to 3 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

This unit is used as rangeland and wildlife habitat.

The potential vegetation on the Strych soil is an overstory of Utah Utah juniper and pinyon with a canopy of 25 percent. The understory vegetation is 35 percent grasses, 15 percent forbs, and 50 percent shrubs. Important plants are Utah juniper, Salina wildrye, Indian ricegrass, and needleandthread.

The site index for Utah juniper and pinyon is 40. Average yield is 6 cords of wood per acre. The potential is good for post or Christmas tree production. The suitability of the soil for harvesting wood products is fair.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. If Utah juniper and pinyon are thinned, desirable plant species present will increase for a short period of time before the Utah juniper and pinyon re-occupy the area.

The suitability of this unit for rangeland seeding is poor. The main limitations are rock fragments on and in the soil, the low annual precipitation, and competition from Utah juniper and pinyon. Broadcast seeding followed by surface dragging of an anchor chain or drag rail to cover the seed is recommended. Plants that may be suitable for seeding are pubescent wheatgrass, crested wheatgrass, and native plants.

This map unit is in capability subclass VIIs and in Semidesert Stony Loam (Utah Juniper-Pinyon) range site.

70—Sula-Razorba families complex. This map unit is on mountainsides throughout the northern part of the Book Cliffs area. Slopes are 50 to 80 percent, convex, and less than 100 feet long. Elevation is 6,000 to 9,000 feet. The average annual precipitation is 16 to 24 inches, the mean annual air temperature is 35 to 42 degrees F, and the average freeze-free period is 30 to 90 days.

This unit is 50 percent Sula family soils and 25 percent Razorba family soils. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are 15 percent shallow, loamy soils that are on very steep slopes and ledges and support Douglas-fir, pinyon, and Utah juniper; 5 percent sandstone Rock outcrop; and 5 percent very deep, loamy, dark-colored soils that are in basins and support aspen.

The Sula family soils are moderately deep and deep and are well drained. They formed in colluvium and residuum derived from interbedded sandstone and shale. The present vegetation in most areas is Douglas-fir, pinyon, and snowberry. No single profile of these soils is typical, but one commonly observed in the survey area has a 3-inch-thick layer of partially decomposed organic material on the surface and about 2 percent of the surface is covered with stones. The surface layer is dark brown sandy loam 3 inches thick. The subsoil is dark brown and dark yellowish brown sandy loam 9 inches thick. The substratum is strong brown and brown loam 10 inches thick. Sandstone is at a depth of 22 inches. Depth to sandstone ranges from 20 to 60 inches or more.

Permeability this Sula family soil is moderate. Available water capacity is 2 to 6 inches. Water supplying capacity is 4 to 16 inches. Effective rooting depth is 20 to 60 inches. The organic matter content of the surface layer is 3 to 5 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

The Razorba family soils are deep and very deep and are well drained. They formed in colluvium and residuum derived from interbedded sandstone and shale. The present vegetation in most areas is Gambel oak, pinyon, and snowberry. No single profile of the Razorba family soils is typical, but one commonly observed in the survey area has a 3-inch-thick layer of partially decomposed leaves and twigs on the surface. The upper 8 inches of the surface layer is very dark grayish brown fine sandy loam, and the lower 12 inches is dark brown fine sandy loam. The subsoil is brown and dark brown fine sandy loam 27 inches thick. The substratum to a depth of 60 inches or more is yellowish brown fine sandy loam.

Depth to sandstone ranges from 40 to 60 inches or more.

Permeability of this Razorba family soil is moderate to moderately rapid. Available water capacity is 5.5 to 9.0 inches. Water supplying capacity is 5 to 16 inches. Effective rooting depth is 40 to 60 inches or more. The organic matter content of the surface layer is more than 5 percent. Runoff is medium, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used as woodland and wildlife habitat.

The potential plant community on the Sula family soils is an overstory of Douglas-fir with a canopy of 75 percent. The understory vegetation is 15 percent grasses, 10 percent forbs, and 75 percent shrubs. Important plants are sedges, bluegrass, penstemon, mountainlover, snowberry, and Utah serviceberry.

The site index for Douglas-fir on this soil is 60. Average yield is about 10,600 board feet per acre for 100-year-old trees 15 inches in diameter or more. The main concerns in producing and harvesting timber are steepness of slope and the hazard of erosion.

The potential plant community on the Razorba family soils is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are Columbia needlegrass, mountain brome, Gambel oak, snowberry, and Utah serviceberry.

This unit is not grazeable by livestock because of the steepness of slope.

This map unit is in capability subclass VIIe. The Sula family soils are in Mountain Very Steep Loam (Douglas-fir) range site, and the Razorba family soils are in Mountain Very Steep Loam (Oak) range site.

71—Thedalund family, cool. This map unit consists of moderately deep, well drained soils on canyon escarpments throughout the Book Cliffs at lower elevations. The soils formed in colluvium and residuum derived dominantly from shale and sandstone. Slopes are 50 to 70 percent, smooth to convex, and less than 50 feet long. The present vegetation in most areas is Wyoming big sagebrush, Salina wildrye, shadscale, and wedgeleaf saltbush. Elevation is 5,200 to 7,000 feet. The average annual precipitation is 10 to 13 inches, the mean annual air temperature is 45 to 49 degrees F, and the average freeze-free season is 90 to 150 days.

No single profile of the Thedalund family soils is typical, but one commonly observed in the survey area has 47 percent of the surface covered with rock fragments, of which 2 percent is boulders, 5 percent is stones, 30 percent is channery fragments, and 10 percent is pebbles. The surface layer is pale olive very stony loam 1 inch thick. The upper 5 inches of the underlying material is pale olive sandy clay loam, the next 4 inches is olive sandy clay loam, and the lower part to a depth of 22 inches is very dark gray silty clay loam. Weathered shale is at a depth of 22 inches. Depth to shale is 20 to 40 inches.

Included in this unit are 10 percent deep, loamy soils that are throughout the unit and support Utah juniper and pinyon; 5 percent Rock outcrop that occurs as ledges and cliffs; 5 percent of shallow, clayey soils that are on steep slopes and support wedgeleaf saltbush, mat saltbush, and galleta; and 5 percent deep, loamy soils that are near the base of escarpments and support shadscale.

Permeability of this Thedalund family soil is moderately slow. Available water capacity is about 2.5 to 7.0 inches. Water supplying capacity is 2.5 to 6.0 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is very rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used as wildlife habitat.

The potential plant community on the Thedalund family soils is 55 percent grasses, 5 percent forbs, and 40 percent shrubs. Important plants are Salina wildrye, shadscale, Wyoming big sagebrush, and green rabbitbrush.

This unit is not grazeable by livestock because of the steepness of slope.

This map unit is in capability subclass VIIe and in Semidesert Very Steep Loam (Wyoming Big Sagebrush) range site.

72—Thedalund family, moist. These moderately deep, well drained soils are on canyon escarpments throughout the lower part of the Book Cliffs. The soils formed in colluvium and residuum derived dominantly from interbedded sandstone and shale. Slopes are 50 to 70 percent, convex, and less than 50 feet long. The present vegetation in most areas is Utah juniper, pinyon, and Salina wildrye. Wyoming big sagebrush is throughout the part of the unit on the eastern side of the survey area. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 9 to 14 inches, the mean annual air temperature is 45 to 49 degrees F, and the average freeze-free season is 90 to 150 days.

No single profile of the Thedalund family soils is typical, but one commonly observed in the survey area has 80 percent of the surface covered with rock fragments, of which 1 percent is boulders, 4 percent is stones, 75 percent is channery fragments, and 10 percent is pebbles. The surface layer is pale brown extremely channery loam 2 inches thick. The next layer is pale brown loam 6 inches thick. The upper 5 inches of the underlying material is brown clay loam, and the lower part to a depth of 36 inches is light gray silty clay loam. Sandstone is at a depth of 36 inches.

Included in this unit are 10 percent shallow, loamy soils that are on narrow benches and support pinyon and Utah juniper; 10 percent Rock outcrop that occurs as ledges; 5 percent moderately deep, loamy soils that are on steep, south-facing side slopes and support Salina wildrye; and 5 percent shallow, clayey soils that are on

the base of escarpments and support wedgeleaf saltbush and mat saltbush.

Permeability of this Thedalund family soil is moderately slow. Available water capacity is about 2.5 to 7.0 inches. Water supplying capacity is 2.5 to 6.0 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is very rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used as wildlife habitat and woodland.

The potential vegetation on the Thedalund family soils is an overstory of Utah juniper and pinyon with a canopy of 10 percent. The understory vegetation is 55 percent grasses, 15 percent forbs, and 30 percent shrubs. Important plants are Salina wildrye, Utah juniper, and pinyon.

The site index for Utah juniper and pinyon is 29. Average yield is 3 cords of wood per acre. The potential is poor for post or Christmas tree production.

This unit is limited for use by livestock because of the steepness of slope and the rock fragments on the surface.

This map unit is in capability subclass VIIe and in Semidesert Very Steep Loam (Utah Juniper-Pinyon) range site.

73—Thedalund family, stony. These moderately deep, well drained soils are on canyon escarpments at the lower elevations throughout the Book Cliffs area. The soils formed in colluvium and residuum derived dominantly from shale and sandstone. Slopes are 50 to 70 percent, convex, and less than 50 feet long. The present vegetation in most areas is Salina wildrye, shadscale, green rabbitbrush, and wedgeleaf saltbush. Elevation is 4,400 to 6,800 feet. The average annual precipitation is 8 to 13 inches, the mean annual air temperature is 46 to 50 degrees F, and the average freeze-free season is 100 to 160 days.

No single profile of the Thedalund family soils is typical, but one commonly observed in the survey area has 47 percent of the surface covered with rock fragments, of which 2 percent is boulders, 5 percent is stones, 30 percent is channery fragments, and 10 percent is pebbles. The surface layer is pale olive very bouldery loam 1 inch thick. The upper 2 inches of the underlying material is pale olive sandy clay loam, the next 4 inches is olive sandy clay loam, and the lower part to a depth of 22 inches is very dark gray silty clay loam. Hard shale is at a depth of 22 inches. Depth to bedrock ranges from 20 to 40 inches.

Included in this unit are 10 percent moderately deep, loamy soils that are °intermingled throughout the unit and near drainageways and support pinyon and Utah juniper; 5 percent Rock outcrop that occurs as ledges and cliffs; 5 percent shallow, clayey soils that are on steep slopes and support wedgeleaf saltbush, mat saltbush, and galleta; and 5 percent deep, loamy soils that are near the base of escarpments and support shadscale.

Permeability of this Thedalund family soil is moderately slow. Available water capacity is about 2.5 to 7.0 inches. Water supplying capacity is 2.5 to 6.0 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 3 percent. Runoff is very rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used for wildlife habitat.

The potential plant community on the Thedalund family soils is 55 percent grasses, 10 percent forbs, and 35 percent shrubs. Important plants are Salina wildrye, shadscale, green rabbitbrush, and wedgeleaf saltbush. This unit is limited for use by livestock because of the steepness of slope and low annual precipitation.

This map unit is in capability subclass VIIe and in Semidesert Very Steep Loam (Salina Wildrye) range site.

74—Thedalund family-Rock outcrop-Badland association. This map unit is on north-, northeast-, and northwest-facing side slopes of pediments and canyon escarpments. It is along the southern boundary of the areas underlain by shale and south of the Book Cliffs. Slope is 30 to 50 percent. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 6 to 10 inches, the mean annual air temperature is 50 to 55 degrees F, and the average freeze-free season is 140 to 180 days.

This unit is 55 percent Thedalund family soils, dry, 30 to 50 percent slopes; 15 percent Rock outcrop; and 15 percent Badland. The Thedalund family soils are mostly on the lower part of ridges, and the Rock outcrop and Badland are on the upper part of ridges.

Included in this unit are about 10 percent deep, loamy soils that are at the base of escarpments and support shadscale and 5 percent very deep, loamy soils that are along drainageways and stream channels and support black greasewood.

The Thedalund family soils are moderately deep and well drained. They are characterized by stones, channery fragments, and rubble scattered on the surface. They formed in colluvium and residuum derived from sandstone and shale. Slopes are convex and generally are less than 50 feet long. The present vegetation in most areas is Salina wildrye, shadscale, and wedgeleaf saltbush. Utah juniper is in some areas, mainly particularly near areas of Rock outcrop. No single profile of the Thedalund family soils is typical, but one commonly observed in the survey area has 60 percent of the surface covered with rock fragments, of which 5 percent is flagstones, 15 percent is channery fragments, and 40 percent is pebbles. The surface layer is pale brown very gravelly sandy loam about 4 inches thick. The next layer is very pale brown clay loam 5 inches thick. Below this is light gray silty clay loam 15 inches thick. Weathered shale is at a depth of 24 inches. Depth to weathered shale ranges from 20 to 40 inches.

Permeability of this Thedalund family soil is moderately slow. Available water capacity is 2.5 to 7.0 inches. Water supplying capacity is 2.5 to 5.0 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

Rock outcrop consists of exposed areas of sandstone. It occurs as cliffs and ledges.

Badland consists of barren areas of actively eroding shale, shale interbedded with gypsum, and thin layers of sandstone. The areas of Badland are highly dissected by drainageways. Angular ridges and nose slopes are prominent.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Thedalund family soils is 45 percent grasses, 10 percent forbs, and 45 percent shrubs. Important plants are Salina wildrye, shadscale, broom snakeweed, and green rabbitbrush. Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments.

The suitability of the Thedalund family soils for rangeland seeding is poor. The main limitations are steepness of slope, restricted soil depth, and low annual precipitation.

This map unit is in capability subclass °VIIs. The Thedalund family soils are in Semidesert Shallow Loam (Salina Wildrye) range site.

75—Toddler-Ravola-Glenton families association. This map unit is on flood plains, along drainageways, and on valley flats throughout the central and southern parts of the survey area. The soils formed in alluvium derived from shale and sandstone. Slopes are 0 to 3 percent, smooth to concave, and highly variable in length. Elevation is 4,000 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 56 degrees F, and the average freeze-free season is 150 to 180 days.

This unit is 25 percent Toddler family soils, 25 percent Ravola family soils, and 20 percent Glenton family soils. The Glenton family soils generally are adjacent to areas strongly influenced by sandstone sediment, and the Ravola family soils are in areas strongly influenced by shale sediment. The Glenton family and Toddler family soils commonly are along deeply incised drainageways and on the upper part of fans, and the Ravola family soils commonly are on broad flats and in basins.

Included in this unit are about 10 percent very shallow, clayey soils that are on adjacent shale pediments and support mat saltbush; 10 percent very deep, silty soils that are in basins and support wedgeleaf saltbush; 5 percent very deep, salt-affected soils on flats; and 5 percent very deep, sandy soils in areas where windblown material has accumulated.

The Toddler family soils are very deep, well drained, and moderately saline to strongly saline. The present vegetation in most areas is mainly mat saltbush, wedgeleaf saltbush, bud sagebrush, and galleta. No single profile of the Toddler family soils is typical, but one commonly observed in the survey area has a surface layer of light brownish gray silt loam 7 inches thick. The upper 5 inches of the underlying material is light brownish gray silt loam, and the lower part to a depth of 60 inches or more is stratified pale brown sandy clay loam and fine sandy loam.

Permeability of this Toddler family soil is moderate. Available water capacity is 6 to 11 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is slow, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate. These soils are subject to rare, very brief periods of flooding during intense local storms in July through September.

The Ravola family soils are very deep, well drained, and moderately saline to strongly saline. The present vegetation in most areas is black greasewood, seepweed, rubber rabbitbrush, and shadscale. No single profile of the Ravola family soils is typical, but one commonly observed in the survey area has a surface layer of reddish brown silt loam 3 inches thick. The upper 4 inches of the underlying material is reddish brown silt loam, the next 3 inches is light reddish brown fine sandy loam, and the lower part to a depth of more than 60 inches is reddish brown and light brown silt loam. These soils are highly stratified.

Permeability of this Ravola family soil is moderately slow. Available water capacity is 8.5 to 11.0. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is moderate to slow, and the hazard of water erosion is moderate. The soils are susceptible to gully erosion and piping in areas where runoff is concentrated. The hazard of soil blowing is moderate. These soils are subject to occasional, very brief periods of flooding in January through April and July through September.

The Glenton family soils are very deep and well drained. The present vegetation in most areas is wedgeleaf saltbush, bud sagebrush, galleta, and shadscale. No single profile of the Glenton family soils is typical, but one commonly observed in the survey area has a surface layer of light yellowish brown fine sandy loam 2 inches thick. The next 17 inches is pale brown and light yellowish brown silt loam, the next 12 inches is light yellowish brown fine sandy loam, the next 24 inches is brown fine sandy loam, and the lower part to a depth of more than 60 inches is light yellowish brown coarse sandy loam. These soils are highly stratified.

Permeability of this Glenton family soil is moderately rapid. Available water capacity is 5.5 to 8.0 inches.

Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is less than 1 percent. Runoff is moderate to slow, and the hazard of water erosion is slight. Deep gullies have formed in areas where runoff is concentrated. The hazard of soil blowing is moderate. These soils are subject to rare, very brief periods of flooding during intense local storms in July through September.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Toddler family and Glenton family soils is 55 percent grasses, 10 percent forbs, and 35 percent shrubs. Important plants are galleta, Indian ricegrass, and wedgeleaf saltbush.

The potential plant community on the Ravola family soils is 60 percent grasses, 10 percent forbs, and 30 percent shrubs. Important plants are alkali sacaton, galleta, seepweed, and black greasewood.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought may adversely affect the production of the perennial vegetation. Partial or total removal of livestock from the range may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and the alkali content of the soils. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants, prostrate kochia, and Russian wildrye.

This map unit is in capability subclass VIIs. The Toddler family and Glenton family soils are in the Alkali Fan range site, and the Ravola family soils are in the Alkali Flat range site.

76—Valleycity-Neiber-Rock outcrop complex. This map unit is on structural benches, ridges, and hogbacks throughout the southern part of the survey area. Slopes are 2 to 25 percent, generally convex, and less than 50 feet long. Elevation is 4,300 to 5,000 feet. The average annual precipitation is 5 to 8 inches, the mean annual air temperature is 51 to 55 degrees F, and the average freeze-free season is 150 to 170 days.

This unit is 40 percent Valleycity very stony fine sandy loam, 10 to 25 percent slopes, on the upper part of ridges and hogbacks and on the edges of structural benches; 20 percent Neiber silt loam, 2 to 15 percent slopes, near the base of ridges and intermingled with the Valleycity soils on structural benches; and 15 percent Rock outcrop.

Included in this unit are 10 percent deep, loamy soils that are at the base of ridges and hogbacks and support fourwing saltbush; 10 percent very deep, loamy soils that support shadscale; and 5 percent very deep, loamy soils along drainageways.

The Valleycity soils are very shallow and shallow and are well drained. They formed in residuum and colluvium derived dominantly from sandstone. The present vegetation in most areas is mainly galleta, shadscale, Indian ricegrass, and blackbrush. Some Utah juniper is on the upper part of slopes. Typically, 60 percent of the surface is covered with rock fragments, of which 10 percent is angular stones, 20 percent is cobbles, and 30 percent is pebbles. The surface layer is light brown very stony fine sandy loam 3 inches thick. The upper 5 inches of the subsoil is brown extremely stony sandy clay loam, and the lower 4 inches is pink extremely stony sandy clay loam. Sandstone is at a depth of 12 inches. Depth to sandstone ranges from 7 to 20 inches.

Permeability of the Valleycity soil is moderate. Available water capacity is less than 2.5 inches. Water supplying capacity is less than 2.5 inches. Effective rooting depth is 7 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight.

The Neiber soil is moderately deep and well drained. They formed in residuum and alluvium derived dominantly from sandstone and interbedded shale. The present vegetation in most areas is galleta, shadscale, and Indian ricegrass. Typically, 15 percent of the surface is covered with gravel and 5 percent is covered with cobbles. The surface layer is yellowish brown silt loam 3 inches thick. The upper 5 inches of subsoil is dark yellowish brown silty clay loam, and the lower 20 inches is yellowish brown silty clay loam. Soft sandstone is at a depth of 28 inches. Depth to sandstone or shale ranges from 20 to 40 inches.

Permeability of the Neiber soil is moderately slow. Available water capacity is 3 to 7 inches. Water supplying capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Rock outcrop consists of exposed areas of sandstone. It occurs as ledges and rims.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on the Valleycity soil is 35 percent grasses, 10 percent forbs, and 55 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and blackbrush.

The potential plant community on the Neiber soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and winterfat.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Severe drought can adversely affect the production of the perennial

vegetation. Partial or total removal of livestock from the rangeland may be necessary.

It is not practical to revegetate large areas of this unit because of the low annual precipitation and the restricted soil depth. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded. Plants that may be suitable for seeding in these areas are adapted native plants and prostrate kochia.

This map unit is in capability subclass VIIs. The Valleycity soil is in Desert Shallow Sandy Loam range site, and the Neiber soil is in Desert Loam range site.

77—Walknolls family, 50 to 80 percent slopes. This map unit consists of shallow, well drained soils on canyon escarpments along the lower face of the Book Cliffs. These soils formed in colluvium and residuum derived from interbedded sandstone and shale. Slopes are convex and less than 50 feet long. They are on all aspects except north ones. The present vegetation in most areas is shadscale, Salina wildrye, galleta, and wedgeleaf saltbush. Elevation is 4,200 to 6,000 feet. The average annual precipitation is 6 to 8 inches, the mean annual air temperature is 48 to 52 degrees F, and the average freeze-free season is 120 to 160 days.

No single profile of the Walknolls family soils is typical, but one commonly observed in the survey area has 25 percent of the surface covered with stones and 3 percent covered with boulders. The surface layer is light yellowish brown extremely bouldery sandy loam 6 inches thick. Below this to a depth of 15 inches is pale brown very gravelly sandy loam. Sandstone is at a depth of 15 inches. Depth to unweathered shale or sandstone ranges from 10 to 20 inches.

Included in this unit are 10 percent Rock outcrop that occurs as sandstone escarpments; 10 percent soils that have most of the surface covered with stones and boulders, support little if any vegetation, and are downslope from sandstone escarpments; 5 percent very shallow, clayey soils that are on toe slopes and support mat saltbush; and 5 percent moderately deep, loamy soils that are intermingled with areas of the Walknolls family soils.

Permeability of this Walknolls family soil is moderately rapid. Available water capacity is less than 2 inches. Water supplying capacity is less than 3 inches. Effective rooting depth is 10 to 20 inches. The organic matter content of the surface layer is less than 1 percent. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is slight.

This unit is used for wildlife habitat.

The potential plant community on the Walknolls family soils is 25 percent grasses, 10 percent forbs, and 65 percent shrubs. Important plants are galleta, Indian ricegrass, shadscale, and wedgeleaf saltbush.

The suitability of this unit for livestock grazing is very poor. The limitations are steepness of slope and the low production of forage.

It is not practical to revegetate large areas of this unit because of the steepness of slope and the low annual precipitation. To control erosion in areas where the need is critical, small areas can be mechanically treated and seeded.

This map unit is in capability subclass VIIe and in Desert Very Steep Shallow Loam (Shadscale) range site.

78—Windwhistle-Begay complex. This map unit is on the higher part of cuestas in the vicinity of Dead Horse Point and east of Arches National Park. Slope is 2 to 10 percent. Elevation is 5,900 to 6,100 feet. The average annual precipitation is 8 to 12 inches, the mean annual air temperature is 49 to 54 degrees F, and the average freeze-free season is 130 to 160 days.

This unit is 40 percent Windwhistle fine sandy loam and 40 percent Begay fine sandy loam. The Windwhistle soil is on gently rolling ridges, and the Begay soil is in open areas on concave and lower lying valley sides. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are about 15 percent shallow, loamy soils that are on ridgetops and support Utah juniper and pinyon and 5 percent Rock outcrop that occurs as small, isolated areas on ridgetops.

The Windwhistle soil is moderately deep and well drained. It formed in eolian and residual material derived dominantly from sandstone. Slope ranges from 2 to 10 percent but is commonly 5 to 10 percent. Slopes are convex and about 50 feet long. The present vegetation in most areas is Wyoming big sagebrush, galleta, winterfat, and fourwing saltbush. Typically, the surface layer is yellowish red fine sandy loam about 4 inches thick. The subsoil is yellowish red fine sandy loam 20 inches thick. The substratum is reddish yellow fine sandy loam 12 inches thick. Sandstone is at a depth of 36 inches. Depth to sandstone ranges from 20 to 40 inches.

Permeability of the Windwhistle soil is moderately rapid. Available water capacity is 2 to 5 inches. Water supplying capacity is 3 to 5 inches. Effective rooting depth is 20 to 40 inches. The organic matter content of the surface layer is 1 to 2 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Begay soil is very deep and well drained. It formed in eolian material and some alluvium derived dominantly from sandstone. Slope ranges from 2 to 10 percent but is commonly 2 to 5 percent. Slopes are generally concave and 75 to 150 feet long. The present vegetation in most areas is mainly galleta, Indian ricegrass, Mormon-tea, needleandthread, and some fourwing saltbush. Typically, the surface layer is yellowish red fine sandy loam 4 inches thick. The subsoil

is yellowish red fine sandy loam 19 inches thick. The upper 20 inches of the substratum is reddish yellow fine sandy loam, and the lower part to a depth of 72 inches is yellowish red fine sandy loam.

Permeability of the Begay soil is moderately rapid. Available water capacity is 6.5 to 9.5 inches. Water supplying capacity is 5.0 to 6.5 inches. Effective rooting depth is 60 inches or more. The organic matter content of the surface layer is 1 to 2 percent. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used as rangeland, wildlife habitat, and recreation areas.

The potential plant community on Windwhistle soil is 50 percent grasses, 10 percent forbs, and 40 percent shrubs. Important plants are Wyoming big sagebrush, Indian ricegrass, needleandthread, and blue grama. Pinyon and Utah juniper may invade in areas where the potential plant community has been depleted.

The potential plant community on Begay soil is 60 percent grasses, 15 percent forbs, and 25 percent shrubs. Important plants are needleandthread, Indian ricegrass, and fourwing saltbush.

Management practices that maintain or improve the rangeland vegetation include proper grazing use, planned grazing systems, and proper location of livestock watering developments. Brush management and rangeland seeding can be used to improve the rangeland vegetation in areas where the desirable forage plants have been depleted.

The suitability of this unit for rangeland seeding is good. Plants suitable for seeding include adapted native plants, intermediate wheatgrass, pubescent wheatgrass, crested wheatgrass, alfalfa, small burnet, and prostrate kochia.

This map unit is in capability subclass VIIe. The Windwhistle soil is in Upland Loam (Basin Big Sagebrush) range site, and the Begay soil is in Semidesert Sandy Loam range site.

Prime Farmland

In this section, prime farmland is defined and discussed and the prime farmland soils in this survey area are listed.

Prime farmland is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, seed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. Adequate moisture and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal units of energy and economic resources, and farming these soils results in the least damage to the environment.

Land designated as prime farmland consists of those soils that are best suited to continuous crop production. Prime farmland soils (1) have an adequate moisture supply, (2) have a mean summer temperature of more than 59 degrees F at a depth of 20 inches, (3) have a pH value ranging from 4.5 to 8.4 at a depth of less than 40 inches and an exchangeable sodium percentage of less than 15, (4) do not have a water table that prevents the production of food, feed, fiber and forage crops, (5) can be managed so the conductivity of the saturation extract above a depth of 20 inches is less than 4 millimhos, (6) are not frequently flooded (less than once in 2 years), (7) have a minimal hazard of erosion °(The product of the K (erodibility) factor times percent slope is 2 or less.), (8) have permeability of 0.06 inches per hour in the upper 20 inches, and (9) have a surface layer that is less than 10 percent rock fragments that are more than 3 inches in diameter.

The only map unit in the survey area that would meet the requirements for prime farmland if irrigated is Flatnose sandy loam, 1 to 8 percent slopes. This is not a recommendation for a particular land use.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, range conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, campgrounds, playgrounds, and trees and shrubs.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*4*). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in

class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Rangeland and Woodland Understory Vegetation

Most of the survey area is used as grazing sites. These sites include areas that support both rangeland and woodland understory vegetation suitable for grazing.

The native vegetation in many parts of the area has been depleted by heavy grazing use. The amount of forage now produced is less than that originally produced. Productivity of the grazing sites can be increased by using management practices that are effective for specific kinds of soil and grazing sites.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on grazing sites are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 5 shows, for each soil, the grazing site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as grazing sites or are suited to use as grazing sites are listed. Explanation of the column headings in table 5 follows.

A *grazing site* is a distinctive kind of land that produces a characteristic natural plant community that differs from natural plant communities on other grazing sites in kind, amount, and proportion of forage plants. The relationship between soils and vegetation was established during this survey; thus, grazing sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of forage plants. Soil reaction, salt content, and a seasonal water table are also important.

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees. The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Total production is the amount of vegetation that can be expected to grow annually on well managed land that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, grasslike plants, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. Because only key species are listed, the percentages do not necessarily total 100. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally, all of the vegetation produced is not used.

Grazing site management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present condition. Grazing site condition is determined by comparing the present plant community with the potential natural plant community on a particular grazing site. The more closely the existing community resembles the potential community, the better the grazing site condition. Grazing site condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in grazing site management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a grazing site condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Recreation

The survey area has many scenic, geologic, and historic points of interest. Areas are used for camping, hiking, hunting, fishing, sightseeing, picnicking, boating, and operating off-road vehicles. More than 90 percent of the survey area is public land that is available for these uses. Areas that have been set aside for protection or

limited use include Canyonlands National Park, Dead Horse Point State Park, and Arches National Park.

Campgrounds, picnic areas, and trails have been developed in most of these areas. A large network of off-road trails, most of which are limited to travel by four-wheel-drive vehicles or motorbikes, provides access to the canyons, rims, mesas, and mountains. The main management concern is soil erosion, which is accelerated in areas where vehicle tracks leave channels in the soil. Relocation of trails, diversion of runoff, and closure and revegetation of eroded trails help to control erosion.

White-water rafting is popular on the Green and Colorado Rivers. Undeveloped campsites along the rivers are intensively used.

With the exception of a few large river bottoms, there is little soil material in the narrow canyons. Use of most soil in the canyons is limited by flooding, sandy texture, rock fragments, and shallow depth to bedrock.

The soils of the survey area are rated in table 6 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 6, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 6 can be supplemented by other information in this survey.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Dwellings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of pebbles, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the

ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following table: Construction materials. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the table, along with the soil maps and soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Construction Materials

Table 7 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 7, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 8 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Taxonomic Units and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (*1*) and the Unified soil classification system (*2*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 9 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Taxonomic Units and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of the soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*,

more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the amount of stable aggregates 0.84 millimeters in size. These are represented idealistically by USDA textural classes. Soils containing rock fragments can occur in any group.

1. Sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.
5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.
6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to wind erosion.

Soil and Water Features

Table 10 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A *thin* pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A *thick* pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is

so thick or massive that blasting or special equipment is needed in excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 11 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquents (*Hapl*, meaning minimal horizonation, plus *aquent*, the suborder of the Entisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Haplaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Taxonomic Units and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*3*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*5*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Abra Series

The Abra series consists of very deep, well drained, moderately permeable soils on alluvial fans and fan terraces. These soils formed in alluvium derived from sandstone and conglomerate. Slopes are 5 to 15 percent. Elevation is 4,900 to 5,500 feet. Average annual precipitation is 9 to 12 inches, and mean annual air temperature is 47 to 51 degrees F.

These soils are fine-loamy, mixed, mesic Ustollic Calciorthids.

Typical pedon of an Abra fine sandy loam, 5 to 15 percent slopes, in an area of Abra-Barx complex; about

9 miles north of Bitter Creek Well; about 2,000 feet east and 2,500 feet north of the southwest corner of sec. 7, T. 17 S., R. 26 E.

A11—0 to 2 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium granular structure; soft, very friable, slightly plastic; few very fine roots; 10 percent pebbles on surface, 5 percent pebbles in horizon; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); abrupt smooth boundary.

A12—2 to 7 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable, slightly plastic; common very fine roots and few fine and medium roots; few very fine and fine pores; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C1ca—7 to 15 inches; very pale brown (10YR 7/3) fine sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

C2ca—15 to 23 inches; very pale brown (10YR 8/3) sandy clay loam, light yellowish brown (10YR 6/4) moist; massive; very hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); diffuse smooth boundary.

C3—23 to 38 inches; light yellowish brown (10YR 6/4) sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; 5 percent pebbles; moderately calcareous; carbonates are in common large soft masses; moderately alkaline (pH 8.2); diffuse smooth boundary.

C4—38 to 60 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine tubular pores; slightly calcareous; carbonates are in common large soft masses; moderately alkaline (pH 8.0).

Depth to the calcic horizon ranges from 7 to 28 inches. Calcium carbonate equivalent is more than 15 percent.

The A horizon is 5 to 15 percent pebbles, cobbles, and stones of sandstone or caliche. It is sandy loam, fine sandy loam, or loam. It has hue of 7.5YR or 10YR. The horizon is moderately alkaline or strongly alkaline and is slightly calcareous to strongly calcareous.

The B horizon is loam or fine sandy loam. It has hue of 7.5YR or 10YR. The horizon is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

The C horizon is fine sandy loam, sandy clay loam, or sandy loam. It has hue of 7.5YR or 10YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 1 to 4.

Aneth Family

The Aneth family consists of very deep, well drained, rapidly permeable soils on valley fills. These soils formed in eolian and alluvial material derived from sandstone. Slopes are 2 to 10 percent. Elevation is 4,100 to 4,400 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 52 to 56 degrees F.

These soils are sandy, mixed (calcareous), mesic Typic Torriorthents.

Reference pedon of an Aneth family soil, 2 to 10 percent slopes, in an area of Dune land-Aneth family complex; near White Wash, about 500 feet west and 1,000 feet north of the southeast corner of sec. 21, T. 23 S., R. 17 E.

C1—0 to 4 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; single grain; loose; few fine roots; few fine tubular pores; 5 percent pebbles on surface and in horizon; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C2—4 to 12 inches; yellowish red (5YR 5/6) loamy sand, reddish brown (5YR 4/4) moist; single grain; loose; few fine roots; 5 percent fine pebbles; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

C3—12 to 44 inches; light brown (7.5YR 6/4) loamy sand, brown (7.5YR 5/4) moist; single grain; loose; few fine roots; 5 percent pebbles; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C4—44 to 66 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 5/4) moist; massive; soft, very friable; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.6).

Bedrock is at a depth of more than 60 inches. The profile is loamy fine sand and loamy sand with strata of sandy loam, gravelly sandy loam, and sandy clay loam below a depth of 40 inches. A thin mantle of fine pebbles commonly is on the surface. Hue is 5YR or 7.5YR. Reaction is moderately alkaline or strongly alkaline.

Arches Series

The Arches series consists of shallow, well drained, rapidly permeable soils on cuestas and structural benches. These soils formed in eolian material and some colluvium and alluvium derived from sandstone. Slopes are 2 to 20 percent. Elevation is 4,700 to 6,000 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 50 to 54 degrees F.

These soils are mixed, mesic Lithic Torripsamments.

Typical pedon of an Arches loamy fine sand, 2 to 10 percent slopes, in an area of Rock outcrop-Arches-Mido complex; about 21 miles south and 1 mile west of Crescent Junction; about 2,200 feet west and 500 feet south of the northwest corner of sec. 18, T. 25 S., R. 20 E., in an area that does not have a cadastral survey:

A1—0 to 2 inches; yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 4/4) moist; weak subangular blocky structure parting to weak fine granular; soft, very friable; few medium and fine roots; common fine and very fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

C—2 to 16 inches; yellowish red (5YR 5/6) loamy fine sand, reddish brown (5YR 5/4) moist; weak medium subangular blocky structure; soft, very friable; common medium and fine roots and few coarse roots; common medium tubular pores; strongly calcareous; moderately alkaline (pH 8.2); abrupt wavy boundary.

R—16 inches; sandstone.

Bedrock is at a depth of 10 to 20 inches. The profile is fine sand or loamy fine sand. It has hue of 7.5YR or 5YR, value of 5 or 6, and chroma of 4 to 6. It is slightly alkaline or moderately alkaline.

Barx Series

The Barx series consists of very deep, well drained, moderately permeable soils on alluvial fans and fan terraces. These soils formed in alluvium derived from sandstone. Slopes are 1 to 5 percent. Elevation is 4,900 to 6,000 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 47 to 51 degrees F.

These soils are fine-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of Barx fine sandy loam (fig. 5), east of Bitter Creek, about 200 feet south and 750 feet east of the northwest corner of sec. 8, T. 17 S., R. 26 E.

A1—0 to 2 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak thin platy structure; soft, very friable, slightly sticky and slightly plastic; few fine and very fine roots; few fine interstitial pores; mildly alkaline (pH 7.5); abrupt smooth boundary.

B21t—2 to 6 inches; brown (7.5YR 4/4) clay loam, strong brown (7.5YR 4/6) moist; weak medium

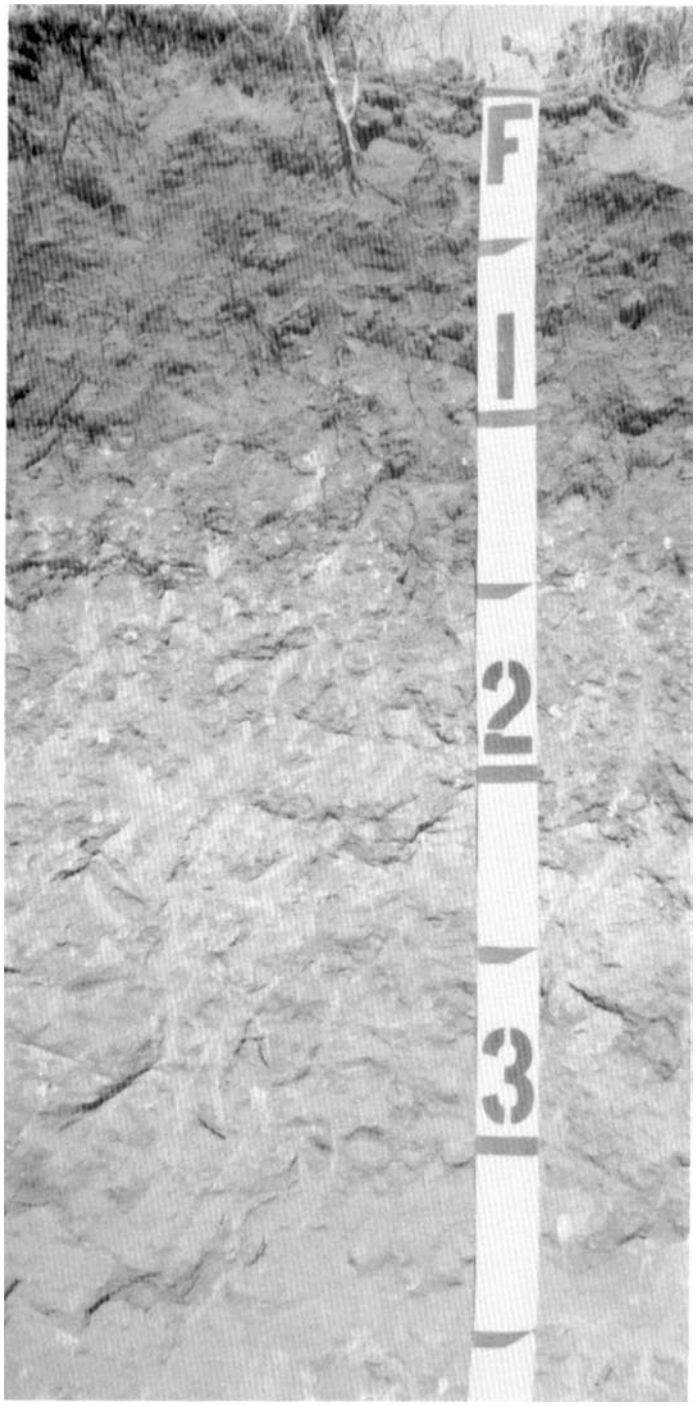


Figure 5.—Profile of Barx fine sandy loam.

subangular blocky structure; soft, friable, sticky and plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; mildly alkaline (pH 7.5); abrupt smooth boundary.

B22t—6 to 13 inches; yellowish red (5YR 5/6) clay loam, yellowish red (5YR 4/6) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; common moderately thick clay films on faces of peds and lining pores; mildly alkaline (pH 7.6); clear smooth boundary.

B23t—13 to 22 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine and fine roots; few fine tubular pores; mildly alkaline (pH 7.8); clear smooth boundary.

B3tca—22 to 33 inches; pink (7.5YR 7/3) sandy clay loam, reddish yellow (7.5YR 7/6) moist; massive; hard, firm, sticky and plastic; few very fine roots; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); clear smooth boundary.

Cca—33 to 60 inches; white (7.5YR 8/1) sandy loam, pink (7.5YR 8/4) moist; massive; hard, firm, slightly sticky and slightly plastic; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0).

The solum is 20 to 40 inches thick. Depth to the calcic horizon ranges from 14 to 25 inches. The particle size control section is 5 to 15 percent rock fragments.

The A horizon has value of 4 to 6 when dry, and it has chroma of 3 or 4. It is mainly fine sandy loam, but is loam or very fine sandy loam in some pedons. Clay content is 10 to 20 percent.

The B horizon has hue of 5YR to 7.5YR, value of 4 to 7 when dry or moist, and chroma of 3 to 6. It is dominantly clay loam, sandy clay loam, and loam. Clay content ranges from 18 to 31 percent. The horizon ranges from mildly alkaline in the upper part to moderately alkaline in the lower part. It is strongly calcareous in the lower part.

The Cca horizon has hue of 5YR or 7.5YR, value of 5 to 8 when dry and 4 to 8 when moist, and chroma of 1 to 6. It commonly is clay loam, sandy clay loam, and very fine sandy loam. Cobbly sandy loam, sandy loam, or silty clay loam is in the lower part in some pedons. Clay content is 16 to 30 percent. The horizon is moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous.

Begay Series

The Begay series consists of very deep, well drained, moderately rapidly permeable soils on cuesta tops and structural benches. These soils formed in eolian material and some alluvium derived from sandstone. Slopes are 2 to 20 percent. Elevation is 4,700 to 6,300 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 49 to 54 degrees F.

These soils are coarse-loamy, mixed, mesic Ustollic Camborthids.

Typical pedon of a Begay fine sandy loam, 2 to 10 percent slopes, in an area of Begay-Sazi complex; about 26 miles south and 1 mile east of Cresent Junction; about 2,400 feet east and 1,900 feet south of the northwest corner of sec. 14, T. 26 S., R. 19 E., in an area that does not have a cadastral survey:

A1—0 to 5 inches; yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; weak very coarse platy structure parting to weak medium and fine subangular blocky; soft, very friable; many very fine and fine roots; many fine and very fine interstitial pores; moderately alkaline (pH 8.0); clear smooth boundary.

B21—5 to 14 inches; yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; weak very coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky; many fine and very fine roots; many very fine tubular pores; slightly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

B22—14 to 26 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky; common very fine and fine roots; many very fine and fine tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca—26 to 37 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 5/4) moist; weak medium, coarse, and very coarse subangular blocky structure; slightly hard, very friable; few very fine and fine roots; common very fine and fine tubular pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); gradual smooth boundary.

C2ca—37 to 60 inches; light reddish brown (5YR 6/4) fine sandy loam, yellowish red (5YR 5/6) moist; weak coarse and very coarse subangular blocky structure; slightly hard, very friable; few fine and very fine roots; common very fine and fine tubular pores; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8).

The A horizon is fine sandy loam, loamy fine sand, sandy loam, or very fine sandy loam. It has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 4 to 6.

The B horizon is very fine sandy loam or fine sandy loam. It has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 4 to 6. It is slightly calcareous to strongly calcareous.

The C horizon is fine sandy loam or sandy loam. It has hue of 2.5YR, 5YR, or 7.5YR, value of 5 to 8 when dry and 4 to 8 when moist, and chroma of 3 to 6. It is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

Begay Variant

The Begay Variant consists of very deep, well drained, moderately rapidly permeable soils on structural benches. These soils formed in alluvium derived from sandstone and shale. Slopes are 3 to 15 percent. Elevation is 6,300 to 6,500 feet. Average annual precipitation is 12 to 14 inches, and mean annual air temperature is 45 to 48 degrees F.

These soils are coarse-loamy, mixed, mesic Ustollic Camborthids.

Typical pedon of Begay Variant fine sandy loam, 3 to 15 percent slopes; about 4 miles northeast of the mouth of Dry Fork of Floy Canyon; about 3,700 feet west and 2,200 feet south of the southwest corner of sec. 6, T. 20 S., R. 19 E., in an area that does not have a cadastral survey:

A1—0 to 2 inches; brown (7.5YR 4/4) fine sandy loam, dark brown (7.5YR 3/4) moist; weak thin platy structure; soft, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; moderately alkaline (pH 8.0); abrupt smooth boundary.

B2—2 to 11 inches; brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine pores; moderately alkaline (pH 8.0); clear smooth boundary.

C1—11 to 19 inches; brown (7.5YR 4/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C2—19 to 26 inches; light brown (7.5YR 6/4) gravelly fine sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; 30 percent pebbles; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C3ca—26 to 36 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); clear smooth boundary.

C4ca—36 to 60 inches; light brown (7.5YR 6/4) very gravelly fine sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; few very fine pores; 40 percent pebbles; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8).

The particle size control section is 5 to 30 percent rock fragments.

The A horizon is fine sandy loam or sandy loam. It has hue of 7.5YR or 10YR.

The B horizon is loam, fine sandy loam, or sandy loam. It has hue of 7.5YR or 10YR.

The C horizon is strata of fine sandy loam, gravelly fine sandy loam, and very gravelly fine sandy loam. It is moderately alkaline or strongly alkaline.

The Begay Variant soils differ from those in the Begay series by having strata of gravelly and very gravelly material in the substratum.

Blueflat Series

The Blueflat series consists of moderately deep, well drained, slowly permeable soils on shale pediments. These soils formed in residuum derived from marine shale. Slopes are 2 to 25 percent. Elevation is 4,500 to 4,900 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 50 to 55 degrees F.

These soils are fine, mixed, mesic Cambic Gypsiorthids.

Typical pedon of a Blueflat loam, 2 to 25 percent slopes, in an area of Blueflat complex; about 12 miles south and 1 mile west of Cresent Junction; about 1,000 feet north and 500 feet east of the southwest corner of sec. 28, T. 24 S., R. 19 E.

A1—0 to 6 inches; light yellowish brown (10YR 6/4) loam, yellowish brown (10YR 5/4) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; common fine tubular pores; 10 percent channers of hard shale and sandstone on surface; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear wavy boundary.

B2—6 to 9 inches; yellowish brown (10YR 5/4) silty clay loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to moderate fine subangular blocky; hard, friable, sticky and plastic; common fine and medium roots; common fine tubular pores; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 9.0); clear wavy boundary.

C1cs—9 to 23 inches; light yellowish brown (2.5Y 6/4) silty clay, olive brown (2.5Y 4/4) moist; moderate fine and medium prismatic structure; hard, friable,

very sticky and very plastic; few fine and very fine roots; few fine tubular pores; moderately alkaline (pH 8.0); clear smooth boundary.

C2cs—23 to 27 inches; light olive brown (2.5Y 5/4) silty clay, grayish brown (2.5Y 5/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky; very hard, very firm, very sticky and very plastic; few fine roots; 65 percent soft shale fragments; moderately alkaline (pH 8.0); clear smooth boundary.

Cr—27 inches; highly weathered shale.

From 5 to 30 percent of the surface is covered with pebble-sized fragments of sandstone, siltstone, or hard shale. Paralithic contact is at a depth of 20 to 40 inches. The gypsic horizon is 15 to 21 inches thick. The profile is 2 to 12 percent channers of hard shale.

The A horizon is loam or silty clay loam. It has hue of 10YR or 2.5Y, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4.

The B horizon is loam, silty clay loam, or silty clay. It has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 6.

The Ccs horizon is silty clay or clay. It has hue of 10YR or 2.5Y, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 2 to 6.

Bookcliff Series

The Bookcliff series consists of deep, well drained, moderately slowly permeable soils on mountainsides. These soils formed in colluvium and alluvium derived dominantly from sandstone and shale. Slopes are 3 to 30 percent. Elevation is 6,400 to 7,800 feet. Average annual precipitation is 15 to 19 inches, and mean annual air temperature is 40 to 44 degrees F.

These soils are fine-loamy, mixed Typic Argiborolls.

Typical pedon of a Bookcliff sandy loam, 3 to 30 percent slopes, in an area of Bookcliff-Shalako complex; along Middle Canyon in the Book Cliffs; about 3,000 feet south and 1,300 feet west of the northeast corner of sec. 30, T. 16 S., R. 24 E.

O1—1 inch to 0; partially decomposed needles and twigs.

A1—0 to 4 inches; brown (10YR 4/3) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; few very fine and fine roots; few very fine and fine pores; mildly alkaline (pH 7.6); abrupt smooth boundary.

B2t—4 to 12 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; soft, friable, slightly sticky and plastic; few very fine, fine, and medium pores; few thin clay films bridging sand grains; moderately calcareous; carbonates are disseminated; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1ca—12 to 32 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; massive; slightly hard, firm, sticky and plastic; few very fine and fine roots; few very fine pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

C2ca—32 to 51 inches; pale brown (10YR 6/3) channery clay loam, brown (10YR 5/3) moist; massive; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine pores; 5 percent pebbles and 10 percent channers; moderately calcareous; carbonates are in few flakes and disseminated; strongly alkaline (pH 8.8); abrupt smooth boundary.

R—51 inches; sandstone.

Bedrock is at a depth of 40 to 60 inches. Secondary carbonates are at a depth of 10 to 20 inches. The mollic epipedon is 10 to 16 inches thick.

The A horizon is sandy loam, loam, or sandy clay loam. It has hue of 5YR to 10YR, value of 3 or 4 when dry and 3 when moist, and chroma of 3 or 4 when dry and 2 or 3 when moist. The horizon is neutral to moderately alkaline.

The B horizon is loam, clay loam, or sandy clay loam. Clay content is 18 to 31 percent. The horizon has hue of 5YR to 10YR, value of 3 to 5 when dry and 3 when moist, and chroma of 2 to 4. It is neutral to moderately alkaline.

The Cca horizon is loam, silty clay loam, channery clay loam, or clay loam. It has hue of 5YR to 10YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3 or 4. It is mildly alkaline to strongly alkaline and is slightly calcareous or moderately calcareous. Calcium carbonate equivalent is 4 to 14 percent.

Chipeta Series

The Chipeta series consists of very shallow and shallow, well drained, slowly permeable soils on highly dissected shale pediments, hills, plains, and side slopes. These soils formed in residuum and alluvium derived from marine shale. Slopes are 1 to 50 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 50 to 56 degrees F.

These soils are clayey, mixed (calcareous), mesic, shallow Typic Torriorthents.

Typical pedon of a Chipeta silty clay loam, 1 to 10 percent slopes, in an area of Chipeta complex; about 5.5 miles south of Thompson; about 2,500 feet east and 1,000 feet north of the southwest corner of sec. 17, T. 22 S., R. 20 E.

C1—0 to 2 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate very fine and fine subangular blocky structure; soft, friable, sticky and plastic; few fine

roots; many fine and medium interstitial pores; very strongly calcareous; strongly alkaline (pH 8.6); abrupt wavy boundary.

C2—2 to 4 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common fine and medium tubular pores; few fine veins and soft spots of gypsum; very strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

C3—4 to 11 inches; light gray (10YR 6/1) silty clay, dark grayish brown (10YR 4/2) moist; few faint large brown (7.5YR 5/4) mottles; weak fine and medium platy structure; hard, firm, very sticky and very plastic; common very fine and fine roots; common fine tubular pores; 25 percent soft shale fragments and many soft spots of gypsum; very strongly calcareous; moderately alkaline (pH 8.4); gradual wavy boundary.

C4—11 to 18 inches; light gray (10YR 6/1) silty clay, dark gray (10YR 4/1) moist; common distinct large brown (7.5YR 5/4) mottles; massive; very hard, firm, very sticky and very plastic; common fine and medium roots; few fine and medium interstitial pores; 70 percent pebble-sized shale fragments; very strongly calcareous; very strongly alkaline (pH 9.4); clear smooth boundary.

Cr—18 inches; weathered shale.

Paralithic contact is at a depth of 5 to 20 inches.

The A horizon, where present, is silty clay loam, clay loam, silty clay, or clay. It has hue of 7.5YR, 10YR, 2.5Y, or 5Y, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous.

The C horizon is silty clay, clay loam, clay, or silty clay loam. It is more than 35 percent clay and 0 to 70 percent soft shale fragments that slake in water. It has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7 when dry and 3 to 6 when moist, and chroma of 2 to 4. It is strongly alkaline or very strongly alkaline and is strongly calcareous or very strongly calcareous.

Dast Family

The Dast family consists of moderately deep and deep, well drained, moderately rapidly permeable soils on canyon escarpments and mountainsides. These soils formed in colluvium and residuum derived dominantly from sandstone and shale. Slopes are 50 to 80 percent. Elevation is 5,200 to 7,700 feet. Average annual precipitation is 12 to 16 inches, and mean annual air temperature is 41 to 45 degrees F.

These soils are coarse-loamy, mixed (calcareous), frigid Typic Ustorthents.

Reference pedon of Dast family, 50 to 80 percent slopes; about 1 mile west of Westwater Canyon; about 3,000 feet east and 1,000 feet north of the northeast corner of sec. 32, T. 17 S., R. 23 E., in an area that does not have a cadastral survey:

O1—0.5 inch to 0; partially decomposed leaves, twigs, and needles.

A11—0 to 5 inches; brown (10YR 5/3) bouldery sandy loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; common very fine roots and few fine and medium roots; 2 percent boulders, 4 percent stones, 5 percent channers, and 10 percent pebbles on surface and 2 percent channers and 5 percent pebbles in horizon; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.

A12—5 to 16 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure parting to weak fine granular; soft, friable; few very fine, fine, and medium roots; 5 percent channers and 5 percent pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca—16 to 21 inches; pale brown (10YR 6/3) channery loam, brown (10YR 5/3) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; 10 percent channers and 5 percent pebbles; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C2ca—21 to 34 inches; pale brown (10YR 6/3) loam, brown (10YR 5/3) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; few very fine roots; 10 percent pebbles; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); abrupt irregular boundary.

R—34 inches; sandstone.

Bedrock is at a depth of 20 to 60 inches. The particle size control section is 5 to 35 percent rock fragments.

The A horizon is extremely bouldery sandy loam, bouldery sandy loam, or very stony sandy loam. Rock fragment content is 15 to 80 percent. The horizon has hue of 5YR to 10YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. In areas where value of the A1 horizon is less than 3.5 when moist, the horizon is too thin to qualify as a mollic epipedon.

The C horizon is loam, channery loam, or gravelly sandy loam. It has hue of 5YR to l0YR, value of 5 to 7 when dry and 3 to 6 when moist, and chroma is 1 to 4. It is strongly alkaline or very strongly alkaline and is slightly calcareous to strongly calcareous.

Factory Series

The Factory Series consists of moderately deep, well drained, moderately rapid permeable soils on remnant pediments and structural benches. These soils formed in alluvial and eolian material derived from sandstone and conglomerate. Slopes are 2 to 10 percent. Elevation is 5,000 to 5,500 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 50 to 54 degrees F.

These soils are coarse-loamy, carbonatic, mesic Ustollic Paleorthids.

Typical pedon of a Factory fine sandy loam, 2 to 10 percent slopes, in an area of Factory-Pastern fine sandy loams; about 1.5 miles south of Dubinky Well; about 2,400 feet east and 1,500 feet north of the southwest corner of sec. 36, T. 24 S., R. 18 E.

A1—0 to 4 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium platy structure; soft, very friable; common very fine, fine, and medium roots; many very fine, fine, and medium interstitial pores; slightly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.

B2—4 to 15 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable; common very fine, fine, and medium roots and few coarse roots; many fine and medium tubular pores; 5 percent pebbles; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear wavy boundary.

B3ca—15 to 22 inches; light reddish brown (5YR 6/4) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, friable; common very fine and fine roots and few medium roots; common coarse and medium tubular pores; 10 percent pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C1ca—22 to 25 inches; pink (7.5YR 7/4) gravelly fine sandy loam, yellowish brown (7.5YR 5/6) moist; massive; soft, very friable; few very fine and fine roots; few fine tubular pores; 5 percent pebbles; 40 percent nodules that are cemented with calcium carbonate; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear wavy boundary.

C2ca—25 to 34 inches; pink (5YR 7/3) gravelly fine sandy loam, light reddish brown (5YR 6/4) moist; massive; hard, very friable, slightly sticky; few very fine, fine, and medium roots; few fine tubular pores; 30 percent nodules that are cemented with calcium carbonate; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); abrupt wavy boundary.

C3cam—34 to 56 inches; pinkish white (5YR 8/2) hardpan that is cemented with calcium carbonate; roots matted on top of hardpan; clear irregular boundary.

C4ca—56 to 63 inches; pinkish white (5YR 8/2) fine sandy loam, pink (5YR 7/4) moist; massive; very hard, friable, slightly sticky; 15 percent pebbles; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0).

Depth to the hardpan is 20 to 40 inches. Thickness of the hardpan ranges from 6 to 36 inches.

The A horizon is fine sandy loam or loamy fine sand. It has hue of 5YR or 7.5YR.

The B horizon is fine sandy loam or gravelly fine sandy loam. Rock fragment content is 5 to 25 percent. The horizon is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

The C horizon is gravelly sandy loam, gravelly fine sandy loam, or gravelly loam. Rock fragment content is 15 to 35 percent. The horizon has hue of 5YR or 7.5YR, value of 5 to 8 when dry and 4 to 7 when moist, and chroma of 2 to 6. It is strongly calcareous or very strongly calcareous.

Falcon Family

The Falcon family consists of very shallow and shallow, well drained, moderately rapidly permeable soils on canyonsides and mountainsides. These soils formed in colluvium and residuum derived dominantly from sandstone. Slopes are 50 to 80 percent. Elevation is 5,900 to 8,600 feet. Average annual precipitation is 12 to 16 inches, and mean annual air temperature is 39 to 44 degrees F.

These soils are loamy, mixed Lithic Haploborolls.

Reference pedon of a Falcon family soil, 50 to 80 percent slopes, in an area of Reva-Falcon families-Rock outcrop complex, in Diamond Canyon, about 4,500 feet west and 3,500 feet south of the northwest corner of sec. 2, T. 18 S., R. 22 E., in an area that does not have a cadastral survey:

O1—2 inches to 0; needles and twigs.

A1—0 to 2 inches; brown (7.5YR 5/4) extremely bouldery sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable; many very fine and fine roots; common fine interstitial pores; 5 percent boulders, 10 percent stones, and 10 percent pebbles on surface; strongly calcareous; carbonates are disseminated; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1—2 to 7 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 3/2) moist; massive; soft, friable; common very fine and few fine roots; common fine tubular pores; 5 percent pebbles; strongly calcareous; carbonates are disseminated;

moderately alkaline (pH 8.0); clear smooth boundary.
C2—7 to 19 inches; brown (7.5YR 5/4) gravelly sandy loam, brown (7.5YR 4/4) moist; massive; soft, friable; common very fine and fine roots and few medium and coarse roots; 5 percent cobbles and 15 percent pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.
R—19 inches; sandstone.

Bedrock is at a depth of 3 to 20 inches. The particle size control section is 5 to 35 percent rock fragments.

The A horizon is dominantly extremely bouldery sandy loam, gravelly sandy loam, or fine sandy loam. It has hue of 2.5Y to 7.5YR, value of 3 to 5 when dry and 3 when moist, and chroma of 1 to 4.

The C horizon is gravelly fine sandy loam, sandy loam, or gravelly sandy loam. It has hue of 2.5Y to 7.5YR, value of 3 to 5 when dry and 2 to 4 when moist, and chroma of 2 to 4. It is mildly alkaline or moderately alkaline and is slightly calcareous to strongly calcareous.

Firth Family

The Firth family consists of very deep, poorly drained and somewhat poorly drained, moderately permeable soils on valley floors. These soils formed in alluvium derived dominantly from sandstone and shale. Slopes are 0 to 3 percent. Elevation is 6,700 to 8,000 feet. Average annual precipitation is 14 to 20 inches, and mean annual air temperature is 39 to 43 degrees F.

These soils are coarse-loamy, mixed Aquic Haploborolls.

Reference pedon of a Firth family soil, 0 to 3 percent slopes, in an area of Firth-Plite families association, along Diamond Canyon; about 750 feet north and 1,000 feet east of the southeast corner of sec. 1, T. 18 S., R. 21 E., in an area that does not have a cadastral survey:

A11—0 to 4 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; many very fine and fine roots; common fine tubular pores; neutral (pH 6.8); abrupt smooth boundary.
A12—4 to 14 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable; common very fine and fine roots; common fine tubular pores; neutral (pH 6.8); abrupt smooth boundary.
B2—14 to 23 inches; olive gray (5Y 4/2) loam, black (5Y 2.5/2) moist; massive; soft, friable, slightly sticky and slightly plastic; few very fine and fine roots; few fine tubular pores; slightly calcareous; carbonates are disseminated; neutral (pH 7.2); abrupt smooth boundary.
C1—23 to 45 inches; olive (5YR 5/3) sandy loam, olive (5YR 4/3) moist; massive; soft, friable; few very fine and fine roots; few fine tubular pores; slightly calcareous; carbonates are disseminated; mildly alkaline (pH 7.4); abrupt smooth boundary.
C2—45 to 60 inches; dark gray (5Y 4/1) clay loam, very dark gray (5Y 3/1) moist; massive; slightly hard, firm, sticky and plastic; moderately calcareous; carbonates are disseminated; mildly alkaline (pH 7.4).

Bedrock is at a depth of 60 inches or more. Depth to a seasonal high water table ranges from 12 to 36 inches. The mollic epipedon is 7 to 60 inches thick or more. The profile is sandy loam, silt loam, loam, or fine sandy loam. Thin strata of clay loam or silty clay loam are below a depth of 40 inches.

Flatnose Series

The Flatnose series consists of very deep, well drained, moderately rapidly permeable soils on narrow fluvial plains and valley bottoms. These soils formed in alluvium derived from sandstone. Slopes are 1 to 8 percent. Elevation is 5,600 to 7,200 feet. Average annual precipitation is 12 to 16 inches, and mean annual air temperature is 45 to 47 degrees F.

These soils are coarse-loamy, mixed (calcareous), mesic Typic Ustifluvents.

Typical pedon of Flatnose sandy loam, 1 to 8 percent slopes, near Westwater Canyon, about 6,000 feet east and 500 feet north of the southeast corner of sec. 16, T. 17 S., R. 22 E., in an area that does not have a cadastral survey:

A1—0 to 4 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to weak fine granular; soft, very friable; common very fine and fine roots; few very fine interstitial pores; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.
C1—4 to 10 inches; brown (10YR 5/3) gravelly sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; few very fine, fine, and medium roots; few very fine interstitial pores; 30 percent fine pebbles; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); clear smooth boundary.
C2—10 to 23 inches; yellowish brown (10YR 5/4) sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; few very fine, fine, and medium roots; few very fine interstitial pores; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); clear smooth boundary.
C3—23 to 32 inches; pale brown (10YR 6/3) gravelly sandy loam, brown (10YR 5/3) moist; massive; soft,

very friable; few very fine and fine roots; few very fine interstitial pores; 30 percent fine pebbles; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C4—32 to 47 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; soft, very friable; few very fine, fine, medium, and coarse roots; few very fine interstitial pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

C5—47 to 60 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable; few very fine roots; few very fine interstitial pores; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2).

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4. It is fine sandy loam or sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. It is stratified sandy loam, gravelly sandy loam, and fine sandy loam. Rock fragment content ranges from 0 to 50 percent but is less than 35 percent in the particle size control section. Clay content is 6 to 18 percent.

Flatnose Family

The Flatnose family consists of very deep, well drained to somewhat poorly drained, moderately rapidly permeable or moderately permeable soils on flood plains and valley floors. These soils formed in alluvium derived from sandstone and shale. Slopes are 0 to 8 percent. Elevation is 4,000 to 6,000 feet. Average annual precipitation is 5 to 12 inches, and mean annual air temperature is 47 to 55 degrees F. °At elevations of less than about 5,300 feet, these soils are along major stream channels where additional moisture is provided by runon or subirrigation.

These soils are coarse-loamy, mixed (calcareous), mesic Typic Ustifluvents.

Reference pedon of a Flatnose family soil, cool, 0 to 3 percent slopes, in an area of Redbank-Flatnose, cool, families association; in San Arroyo Canyon, about 1,000 feet south and 250 feet west of the northeast corner of sec. 24, T. 17 S., R. 24 E.

A1—0 to 6 inches; light brownish gray (2.5YR 6/2) bouldery very fine sandy loam, grayish brown (2.5Y 5/2) moist; weak thick platy structure; soft, very friable; few very fine and fine roots; few very fine and fine pores; 5 percent channers, 3 percent stones, 1 percent boulders, and 15 percent pebbles on surface; moderately alkaline (pH 8.0); abrupt smooth boundary.

C1—6 to 15 inches; light brownish gray (2.5YR 6/2) gravelly silt loam, grayish brown (2.5YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; 30 percent pebbles; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt wavy boundary.

C2—15 to 28 inches; light yellowish brown (2.5YR 6/4) cobbly very fine sandy loam, grayish brown (2.5YR 5/2) moist; massive; slightly hard, very friable, slightly plastic; few very fine and fine roots; 5 percent channers, 10 percent cobbles, and 15 percent pebbles; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt wavy boundary.

C3—28 to 34 inches; light yellowish brown (2.5YR 6/4) fine sandy loam, grayish brown (2.5YR 5/2) moist; massive; slightly hard, very friable; few very fine and fine roots; few fine tubular pores; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt wavy boundary.

C4—34 to 44 inches; light brownish gray (2.5YR 6/2) very gravelly loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine, fine, and medium roots; 10 percent channers, 5 percent cobbles, and 30 percent pebbles; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0); abrupt wavy boundary.

C5—44 to 60 inches; light brownish gray (2.5Y 6/2) very channery fine sandy loam, grayish brown (2.5Y 5/2) moist; massive; slightly hard, very friable, slightly plastic; few very fine and fine roots; 20 percent channers and 15 percent cobbles; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8).

The particle size control section is 5 to 35 percent rock fragments, including pebbles and some cobbles and stones. Some thin strata are 35 to 80 percent rock fragments.

The A horizon is sandy clay loam, bouldery very fine sandy loam, sandy loam, or gravelly sandy loam. It has hue of 2.5YR to 2.5Y.

The C horizon dominantly is strata of loam, fine sandy loam, sandy loam, gravelly silt loam, cobbly very fine sandy loam, and gravelly silt loam. Thin strata of sand, very gravelly loam, very channery fine sandy loam, and very gravelly sandy loam are in some pedons. The horizon has hue of 2.5YR to 2.5Y. It is moderately alkaline or strongly alkaline and is slightly calcareous or strongly calcareous. Mottles that have chroma of 2 or less and gleying occur in some pedons below a depth of 36 inches.

Glenton Family

The Glenton family consists of very deep, well drained, moderately rapidly permeable soils on flood plains and along drainageways. These soils formed in alluvium derived dominantly from sandstone. Slopes are 0 to 3 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 56 degrees F.

These soils are coarse-loamy, mixed (calcareous), mesic Typic Torrifluvents.

Reference pedon of a Glenton family soil, 0 to 3 percent slopes, in an area of Toddler-Ravola-Glenton families association, in Salt Wash, about 2,500 feet east and 1,250 feet south of the northeast corner of sec. 36, T. 21 S., R. 20 E., in an area that does not have a cadastral survey:

C1—0 to 2 inches; light yellowish brown (10YR 6/4) fine sandy loam, brown (10YR 4/3) moist; weak thin platy structure; soft, very friable; many very fine and fine roots; many very fine interstitial pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

C2—2 to 6 inches; pale brown (10YR 6/3) silt loam, dark brown (10YR 4/2) moist; moderate coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine tubular pores; very strongly calcareous; carbonates are disseminated; very strongly alkaline (pH 9.4); abrupt smooth boundary.

C3—6 to 19 inches; light yellowish brown (10YR 6/4) silt loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky; many very fine and fine roots; many very fine and fine tubular pores; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); abrupt smooth boundary.

C4—19 to 31 inches; light yellowish brown (10YR 6/4) fine sandy loam, dark brown (10YR 4/2) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; common very fine and fine roots; common very fine and fine tubular pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

C5—31 to 55 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable; few very fine roots; few very fine tubular pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

C6—55 to 62 inches; light yellowish brown (10YR 6/4) coarse sandy loam, brown (10YR 4/3) moist; massive; slightly hard, very friable; few very fine roots; few very fine tubular pores; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4).

Bedrock is at a depth of 60 inches or more. The particle size control section is less than 15 percent rock fragments.

The C horizon is fine sandy loam, silt loam, very coarse sandy loam, very fine sandy loam, or loam. Thin strata of clay loam, loamy fine sand, and silty clay loam are in some pedons. The C horizon has hue of 5YR to 10YR. It is moderately alkaline to very strongly alkaline and is slightly calcareous to very strongly calcareous.

Hanksville Family

The Hanksville family consists of moderately deep, well drained, slowly permeable soils on escarpments of structural benches, mesas, and cuestas. These soils formed in colluvium and residuum derived dominantly from shale. Slopes are 30 to 50 percent. Elevation is 4,200 to 6,100 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 47 to 55 degrees F.

These soils are fine, mixed (calcareous), mesic Typic Torriorthents.

Reference pedon of a Hanksville family soil, 30 to 50 percent slopes, in an area of Hanksville family-Badland complex, in San Arroyo Canyon, about 1,000 feet north and 2,000 feet east of the southwest corner of sec. 30, T. 17 S., R. 25 E.

A11—0 to 3 inches; light yellowish brown (2.5YR 6/4) extremely bouldery silt loam, light olive brown (2.5YR 5/4) moist; weak thin platy structure; soft, friable, sticky and plastic; few very fine roots; few fine pores; 7 percent boulders, 10 percent channers, and 30 percent pebbles on surface; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.

A12—3 to 9 inches; light yellowish brown (5Y 6/4) silty clay loam, light olive brown (2.5Y 5/4) moist; weak medium subangular blocky structure parting to weak fine granular; soft, friable, sticky and plastic; few very fine roots; few fine tubular pores; 10 percent pebbles; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

C1—9 to 14 inches; olive brown (2.5Y 4/4) silty clay loam, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine roots; few fine interstitial pores; 80 percent soft shale fragments that slake in water; neutral (pH 7.0); clear wavy boundary.

C2—14 to 23 inches; olive brown (2.5Y 4/4) silty clay, very dark grayish brown (2.5Y 3/2) moist; massive; slightly hard, friable, sticky and plastic; few very fine

roots; few fine interstitial pores; 80 percent soft shale fragments that slake in water; neutral (pH 7.0); clear wavy boundary.
C3—23 to 35 inches; dark gray (2.5Y 4/0) silty clay, dark gray (2.5Y 4/0) moist; massive; slightly hard, firm, sticky and plastic; few very fine roots; 80 percent soft shale fragments that slake in water; neutral (pH 7.0); diffuse wavy boundary.
Cr—35 inches; hard gypsiferous shale.

Paralithic contact is at a depth of 20 to 40 inches. The particle size control section is 35 to 50 percent clay.

The A horizon, where present, is flaggy loam, bouldery silty clay loam, very flaggy silt loam, or extremely bouldery silt loam. Clay content is 14 to 35 percent. Rock fragment content is 15 to 80 percent. The rock fragments are boulders and flagstones of sandstone and channers and pebbles of sandstone and shale. The horizon has hue of 5Y to 5YR.

The C horizon is silt loam, clay loam, or silty clay loam in the upper part and is silty clay or clay in the lower part. The horizon has hue of 5Y to 5YR. It is neutral to very strongly alkaline.

Hostage Series

The Hostage series consists of deep, well drained, moderately slowly permeable soils on alluvial fans. These soils formed in alluvium over residuum derived from shale and sandstone. Slopes are 3 to 15 percent. Elevation is 4,500 to 6,000 feet. Average annual precipitation is 6 to 8 inches, and mean annual air temperature is 47 to 51 degrees F.

These soils are fine-loamy, mixed (calcareous), mesic Typic Torriorthents.

Typical pedon of a Hostage gravelly fine sandy loam, 3 to 15 percent slopes, in an area of Hostage-Chipeta complex, near Horse Canyon, about 700 feet north and 2,400 feet east of the southwest corner of sec. 4, T. 21 S., R. 18 E.

A1—0 to 3 inches; light yellowish brown (10YR 6/4) gravelly fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak thin platy structure; soft, very friable; common very fine and fine roots; common very fine and fine pores; 15 percent pebbles and 2 percent cobbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.
C1—3 to 18 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; weak, moderate subangular blocky structure; soft, very friable; slightly plastic; common very fine, few fine and medium roots; few very fine and fine pores; 15 percent pebbles, 5 percent cobbles; strongly calcareous; carbonates are few irregular soft masses and coatings on pebble faces; strongly alkaline (pH 8.6); clear smooth boundary.
C2—18 to 24 inches; light yellowish brown (10YR 6/4) gravelly loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly plastic; few very fine roots; few very fine and fine pores; 15 percent pebbles and 5 percent cobbles; strongly calcareous; carbonates occur as few rounded soft masses and as coatings on pebbles; strongly alkaline (pH 8.6); clear smooth boundary.
C3—24 to 32 inches; grayish brown (10YR 5/1) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine pores; 20 percent pebbles; slightly calcareous; carbonates occur as few soft masses; moderately alkaline (pH 8.0); clear smooth boundary.
C4—32 to 42 inches; grayish brown (2.5YR 5/4) silty clay, dark grayish brown (2.5YR 4/2) moist; massive; hard, firm, sticky and plastic; few very fine roots; few very fine pores; slightly calcareous; carbonates occur as coatings on shale plates; strongly alkaline (pH 8.8); clear smooth boundary.
C5r—42 inches; partially weathered gypsiferous shale.

Paralithic contact is at a depth of 40 to 60 inches. The particle size control section is 15 to 35 percent rock fragments.

The A horizon commonly is gravelly fine sandy loam, fine sandy loam, or loam. It has hue of 10YR or 2.5Y, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is mildly alkaline or moderately alkaline and is slightly calcareous or moderately calcareous. Rock fragment content is 5 to 35 percent.

The C horizon is dominantly gravelly loam, gravelly clay loam, or gravelly sandy clay loam in the upper part and is gravelly clay loam, silty clay loam, or gravelly sandy clay loam in the lower part. Clay content generally increases with increasing depth. Rock fragment content averages 15 to 35 percent. The lower part of the horizon is 20 to 90 percent shale fragments that slake in water. The horizon has hue of 10YR or 2.5Y, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is mildly alkaline to strongly alkaline and is moderately calcareous or strongly calcareous.

Hub Family

The Hub family consists of deep and very deep, well drained, moderately permeable soils on mountainsides. These soils formed in colluvium and residuum derived dominantly from sandstone and shale. Slopes are 50 to 80 percent. Elevation is 7,000 to 9,100 feet. Average annual precipitation is 20 to 25 inches, and mean annual air temperature is 34 to 40 degrees F.

These soils are fine-loamy, mixed Mollic Cryoboralfs.

Reference pedon of Hub family, 50 to 80 percent slopes, in Horse Canyon, about 1,500 feet north and 1,000 feet west of the southwest corner of sec. 9, T. 18

S., R. 19 E., in an area that does not have a cadastral survey:

O1—3 inches to 0; decomposed leaves, twigs, and needles.
A1—0 to 6 inches; dark brown (10YR 4/3) very stony sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to weak medium granular; soft, very friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few very fine, fine, medium, and coarse tubular pores; 5 percent stones and 1 percent boulders on surface and 15 percent cobbles and 5 percent pebbles in horizon; mildly alkaline (pH 7.6); clear smooth boundary.
A2—6 to 14 inches; brown (7.5YR 5/4) stony sandy loam, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable; common fine roots and few very fine, medium, and coarse roots; few very fine and fine tubular pores and common medium tubular pores; 10 percent stones, 5 percent cobbles, and 10 percent pebbles; mildly alkaline (pH 7.6); gradual smooth boundary.
B21t—14 to 21 inches; brown (7.5YR 5/4) stony sandy loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and few very fine, medium, and coarse roots; common fine and medium tubular pores; 10 percent stones, 10 percent cobbles, and 5 percent pebbles; mildly alkaline (pH 7.6); clear smooth boundary.
B22t—21 to 31 inches; brown (7.5YR 5/2) gravelly sandy clay loam, brown (7.5YR 5/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic, few very fine, fine, medium, and coarse roots; common fine and medium pores; few thin clay films bridging sand grains and in patches; 5 percent stones, 5 percent cobbles, and 10 percent pebbles; mildly alkaline (pH 7.6); clear smooth boundary.
C1—31 to 60 inches; strong brown (7.5YR 5/6) cobbly sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine and medium roots; 20 percent cobbles and 20 percent pebbles; mildly alkaline (pH 7.6).

Bedrock is at a depth of 40 to 60 inches or more. The mollic epipedon is 3 to 10 inches thick. The particle size control section is 5 to 35 percent rock fragments.

The A horizon is loam, very stony sandy loam, or stony sandy loam. It has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 4. It is neutral to moderately alkaline.

The B horizon is stony sandy loam, gravelly sandy clay loam, sandy loam, or loam. It has hue of 7.5YR or 10YR, value of 5 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is neutral to moderately alkaline.

The C horizon is cobbly sandy loam, channery loam, sandy loam, or gravelly sandy loam. It has hue of 7.5YR to 2.5Y, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 6. It is mildly alkaline to strongly alkaline.

Killpack Series

The Killpack series consists of moderately deep, well drained, moderately slowly permeable soils on shale pediments and plains. These soils formed in colluvium, alluvium, and residuum derived from shale. Slopes are 1 to 25 percent. Elevation is 4,500 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 50 to 55 degrees F.

These soils are fine-silty, mixed (calcareous), mesic Typic Torriorthents.

Typical pedon of Killpack silt loam, 1 to 10 percent slopes; about 6 miles north of Harley Dome; about 3,000 feet west and 250 feet north of the southeast corner of sec. 2, T. 18 S., R. 25 E.

A1—0 to 4 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; moderate thin platy structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; common fine and medium roots; common fine vesicular pores; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.
C1—4 to 14 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; slightly hard, friable, sticky and slightly plastic; common very fine, fine, and medium roots; common fine tubular pores; 20 percent pebble-sized soft shale fragments; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.
C2—14 to 23 inches; light brownish gray (10YR 6/2) silty clay loam, brown (10YR 5/3) moist; massive; hard, firm, sticky and plastic; common fine roots; common fine tubular pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.
C3—23 to 38 inches; grayish brown (10YR 5/2) silty clay loam, grayish brown (10YR 5/2) moist; massive; hard, firm, sticky and slightly plastic; few fine roots; few fine tubular pores; 20 percent hard shale fragments and 55 percent soft shale fragments; slightly calcareous; moderately alkaline (pH 8.2); clear smooth boundary.
Cr—38 inches; gypsiferous shale.

Paralithic contact is at a depth of 20 to 40 inches.

The A horizon is silt loam, silty clay loam, clay loam, loam, or fine sandy loam. It has hue of 10YR or 2.5Y,

value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 2 to 4.

The C horizon is silt loam or silty clay loam. It is 18 to 35 percent clay and less than 15 percent sand that is coarser than very fine sand. The horizon has hue of 10YR or 5Y, value of 5 to 7 when dry and 3 to 7 when moist, and chroma of 2 to 4. It is moderately alkaline or strongly alkaline.

Leeko Series

The Leeko series consists of very deep, well drained, moderately slowly permeable soils on alluvial fans and fan terraces. These soils formed in alluvium derived from sandstone and shale. Slopes are 0 to 3 percent. Elevation is 4,400 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 55 degrees F.

These soils are fine-loamy, mixed, mesic Typic Natrargids.

Typical pedon of Leeko fine sandy loam along Interstate 70, along Cottonwood Wash, about 2,000 feet east and 100 feet north of the southwest corner of sec. 11, T. 20 S., R. 24 E.

A2—0 to 2 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common fine interstitial pores; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); clear smooth boundary.

B21t—2 to 5 inches; brown (7.5YR 5/4) loam, brown (7.5YR 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common fine and medium tubular pores; common thin patchy clay films on faces of peds and lining pores; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear irregular boundary.

B22t—5 to 17 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; hard, firm, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; common fine tubular pores; common thin clay films on faces of peds and lining pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

B3ca—17 to 20 inches; brown (7.5YR 5/4) loam, brown (7.5YR 4/4) moist; moderate coarse prismatic structure; very hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine tubular pores; 10 percent fine soft masses of calcium carbonate; moderately calcareous; carbonates are disseminated; very strongly alkaline (pH 9.4); clear irregular boundary.

C1ca—20 to 33 inches; light brown (7.5YR 6/4) sandy loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable; few very fine and fine roots; few fine tubular pores; strongly calcareous; carbonates are disseminated; very strongly alkaline (pH 9.6); clear smooth boundary.

C2ca—33 to 42 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky; few very fine and fine roots; few fine tubular pores; strongly calcareous; carbonates are disseminated; very strongly alkaline (pH 9.6); clear smooth boundary.

C3—42 to 60 inches; light brown (7.5YR 6/4) very fine sandy loam, brown (7.5YR 4/4) moist; massive; loose, very friable; few very fine and fine roots; few fine tubular pores; slightly calcareous; carbonates are disseminated; very strongly alkaline (pH 9.4).

The solum is 12 to 20 inches thick. Rock fragment content is less than 15 percent. Depth to the calcic horizon ranges from 10 to 24 inches.

The A horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 when moist, and chroma of 3 or 4. It is moderately alkaline or strongly alkaline and is slightly calcareous or moderately calcareous.

The B horizon has hue of 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. It is strongly alkaline or very strongly alkaline and is moderately calcareous to strongly calcareous.

The C horizon is silty clay loam, sandy loam, silt loam, or very fine sandy loam. It has hue of 7.5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 to 4.

Lockerby Series

The Lockerby series consists of moderately deep, well drained, very slowly permeable soils on mesas and cuestas. These soils formed in alluvium and residuum derived dominantly from sandstone and shale. Slopes are 3 to 15 percent. Elevation is 5,200 to 6,200 feet. Average annual precipitation is 10 to 12 inches, and mean annual air temperature is 45 to 50 degrees F.

These soils are fine, montmorillonitic, mesic Ustertic Camborthids.

Typical pedon of a Lockerby cobbly fine sandy loam, 3 to 15 percent slopes, in an area of Lockerby-Shalako complex; about 2.5 miles northwest of the mouth of Right Hand Tusher Canyon, in the Book Cliffs; about 2,000 feet south and 1,000 feet west of the northwest corner of sec. 32, T. 19 S., R. 17 E.

A1—0 to 3 inches; pale brown (10YR 6/3) cobbly fine sandy loam, brown (10YR 5/3) moist; weak medium platy structure; soft, friable, slightly sticky and

slightly plastic; common very fine and fine roots and few medium roots; common very fine and fine interstitial pores and few medium interstitial pores; 40 percent pebbles, 5 percent cobbles, and 2 percent stones on surface and 5 percent cobbles in horizon; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); abrupt smooth boundary.

B1—3 to 12 inches; pale brown (10YR 6/3) silty clay loam, pale brown (10YR 5/3) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine and few very fine roots; common fine and very fine interstitial pores; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.6); clear smooth boundary.

Cca—12 to 22 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; massive parting to moderate medium subangular blocky; hard, firm, sticky and plastic; few fine and very fine roots; few very fine interstitial pores; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0); gradual smooth boundary.

Cs—22 to 28 inches; light gray (2.5Y 7/2) silty clay, grayish brown (2.5Y 5/2) moist; massive; hard, firm, sticky and plastic; few fine and very fine roots; few very fine interstitial pores; few fine gypsum crystals; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0); abrupt smooth boundary.

Cr—28 inches; gypsiferous shale.

Paralithic contact is at a depth of 20 to 40 inches. These soils have cracks 0.25 to 1.0 inch wide that extend from the surface to the underlying bedrock at some time in summer.

The A horizon is dominantly cobbly fine sandy loam, gravelly sandy loam, gravelly fine sandy loam, or gravelly loam, but it is fine sandy loam in some pedons. Rock fragment content is 5 to 25 percent. The horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3. It is moderately alkaline or strongly alkaline and is slightly calcareous to strongly calcareous.

The B horizon is dominantly silty clay loam or clay. It has hue of 10YR or 2.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. It is slightly calcareous to strongly calcareous.

The C horizon is dominantly clay or silty clay. It has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 3 to 6 when moist, and chroma of 1 to 4. It is moderately alkaline to very strongly alkaline and is moderately calcareous or strongly calcareous.

Mack Series

The Mack series consists of very deep, well drained, moderately permeable soils on alluvial fan pediments. These soils formed in alluvium derived from sandstone and shale. Slopes are 2 to 6 percent. Elevation is 4,600 to 5,200 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 50 to 54 degrees F.

These soils are fine-loamy, mixed, mesic Typic Haplargids.

Typical pedon of Mack loam, 2 to 6 percent slopes, about 8 miles north of Agate Oilfield, about 250 feet north and 1,000 feet west of the southeast corner of sec. 31, T. 18 S., R. 24 E.

A1—0 to 3 inches; yellowish brown (10YR 5/4) loam, brown (10YR 4/3) moist; weak fine granular structure; soft, very friable; common very fine and fine roots; mildly alkaline (pH 7.8); clear smooth boundary.

B2t—3 to 11 inches; brown (7.5YR 5/4) loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common fine and medium tubular pores; common thin, patchy clay films bridging sand grains and lining pores; 2 percent pebbles; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear wavy boundary.

B3tca—11 to 16 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common very fine and fine roots; common fine and medium tubular pores; common thin clay films lining pores; 3 percent pebbles; moderately calcareous; carbonates occur as common medium and large soft masses; moderately alkaline (pH 8.4); clear smooth boundary.

C1ca—16 to 23 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky; common very fine and fine roots; common fine and medium tubular pores; 7 percent pebbles; strongly calcareous; carbonates occur as common fine and medium soft masses; strongly alkaline (pH 8.6); clear wavy boundary.

C2—23 to 33 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm; few very fine and fine roots; few fine and medium tubular pores; 3 percent pebbles; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear wavy boundary.

C3—33 to 60 inches; light yellowish brown (2.5Y 6/4) silt loam, light olive brown (2.5Y 5/4) moist; massive; slightly hard, friable; few very fine and fine roots; few fine and medium tubular pores; 3 percent pebbles; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6).

The solum is 11 to 33 inches thick. Secondary carbonates are at a depth of 8 to 33 inches.

The A horizon has hue of 7.5YR to 2.5Y, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3 or 4. It is dominantly very fine sandy loam, fine sandy loam, loam, or sandy loam but is silt loam in a few areas. Clay content is 5 to 17 percent. The horizon is dominantly mildly alkaline or moderately alkaline. In areas where these soils have an overwashed surface, the horizon is strongly alkaline.

The B horizon has hue of 5YR to 10YR, value of 5 to 8 when dry and 4 to 6 when moist, and chroma of 3 to 6. It is loam, silt loam, or clay loam. Clay content is 18 to 33 percent. Common thin or moderately thin clay films are throughout the horizon.

The Cca horizon has hue of 2.5Y to 10YR, value of 6 to 8 when dry and 4 to 7 when moist, and chroma of 3 to 6. It is silt loam, loam, very fine sandy loam, or fine sandy loam. Clay content dominantly is 5 to 19 percent. The horizon is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

Mesa Series

The Mesa series consists of very deep, well drained, moderately permeable soils on old alluvial fan pediments and fan terraces. These soils formed in mixed alluvium derived from sandstone and conglomerate. Slopes are 2 to 6 percent. Elevation is 4,100 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 56 degrees F.

These soils are fine-loamy, mixed, mesic Typic Haplargids.

Typical pedon of Mesa fine sandy loam, 2 to 6 percent slopes; about 2.5 miles south of Thompson; about 1,500 feet west and 200 feet north of the southeast corner of sec. 32, T. 21 S., R. 20 E.

A1—0 to 3 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate fine and medium platy structure; soft, friable; few fine and medium roots; many fine and medium interstitial pores; 10 percent fine pebbles on surface; slightly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

B1—3 to 10 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, friable; many fine and medium roots and few coarse roots; many fine and medium tubular pores; 10 percent fine pebbles; slightly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

B2t—10 to 16 inches; reddish yellow (5YR 6/6) loam, yellowish red (5YR 4/6) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine and medium roots and few coarse roots; many fine and medium tubular pores; few thin patchy clay films lining pores and bridging sand grains; 5 percent fine pebbles; slightly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

B3ca—16 to 24 inches; pink (5YR 7/4) loam, yellowish red (5YR 5/6) moist; weak fine and medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine and medium roots; many fine and medium tubular pores; 10 percent pebbles; very strongly calcareous; carbonates occur as segregated soft masses and as coatings on the underside of pebbles; strongly alkaline (pH 9.0); abrupt wavy boundary.

C1ca—24 to 37 inches; pink (5YR 8/3) gravelly loam, pink (5YR 7/4) moist; weak fine and medium subangular blocky structure; very hard, friable, sticky and plastic; few fine and medium roots; many very fine, fine, and medium tubular pores; 25 percent pebbles; very strongly calcareous; carbonates are disseminated; very strongly alkaline (pH 9.6); clear wavy boundary.

C2ca—37 to 54 inches; pink (5YR 8/3) very gravelly fine sandy loam, pink (5YR 7/4) moist; massive; very hard, firm; few fine and medium roots; common fine and medium tubular pores; 40 percent pebbles; very strongly calcareous; carbonates are disseminated; very strongly alkaline (pH 9.6); clear wavy boundary.

C3ca—54 to 60 inches; reddish yellow (7.5YR 7/6) loam, light brown (7.5YR 6/4) moist; massive; hard, friable; slightly sticky and slightly plastic; few fine roots; many very fine and fine tubular pores; 10 percent pebbles; very strongly alkaline (pH 9.2).

Bedrock is at a depth of 60 inches or more. Secondary carbonates are at a depth of 12 to 36 inches. The particle size control section is 5 to 15 percent rock fragments. From 5 to 20 percent of the surface is covered with pebbles of sandstone or chert. The C horizon is 35 to 60 percent pebbles and cobbles. Thickness of the very gravelly or cobbly strata ranges from 2 feet to several feet.

The A horizon is fine sandy loam or loam. It has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

The B horizon is fine sandy loam, loam, or clay loam. Clay content is 18 to 30 percent. The horizon has hue of 5YR, 7.5YR, or 10YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 6.

The C horizon is gravelly loam, very gravelly fine sandy loam, gravelly fine sandy loam, very gravelly sandy loam, or loam. It has hue of 5YR, 7.5YR or 10YR, value of 6 to 8 when dry and 4 to 7 when moist, and chroma of 3 to 6. It is strongly alkaline or very strongly alkaline and is strongly calcareous or very strongly calcareous.

Mido Series

The Mido series consists of very deep, excessively drained, rapidly permeable soils on structural benches and cuestas. These soils formed in eolian material derived from sandstone. Slopes are 2 to 20 percent. Elevation is 4,700 to 6,000 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 50 to 54 degrees F.

These soils are mixed, mesic Ustic Torripsamments.

Typical pedon of Mido loamy fine sand, 2 to 20 percent slopes; about 20 miles south of Cresent Junction; about 2,100 feet west and 2,000 feet north of the southeast corner of sec. 9, T. 25 S., R. 19 E., in an area that does not have a cadastral survey:

A1—0 to 7 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 5/6) moist; weak medium and coarse subangular blocky structure parting to single grain; soft, very friable; common very fine and fine roots and few medium roots; common very fine and fine interstitial pores and few medium interstitial pores; moderately alkaline (pH 8.0); gradual wavy boundary.

C1—7 to 15 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 5/6) moist; single grain; loose; common very fine and fine roots and few coarse roots; common very fine and fine tubular pores and few medium tubular pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); diffuse wavy boundary.

C2—15 to 60 inches; reddish yellow (5YR 6/8) loamy fine sand, yellowish red (5YR 5/6) moist; single grain; soft, very friable; common very fine and fine roots and few coarse roots; common very fine and fine tubular pores and few medium tubular pores; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.8).

The profile is loamy fine sandy or fine sandy. Bedrock is at a depth of 60 inches or more. The profile is mildly alkaline to strongly alkaline. It has hue of 5YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 6 to 8.

Moenkopie Series

The Moenkopie series consists of very shallow and shallow, well drained, moderately rapidly permeable soils on structural benches, cuestas, and mesas. These soils formed in residual and eolian material derived from sandstone. Slopes are 3 to 20 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 55 degrees F.

These soils are loamy, mixed (calcareous), mesic Lithic Torriorthents.

Typical pedon of a Moenkopie fine sandy loam, 3 to 20 percent slopes, in an area of Moenkopie-Rock outcrop complex; about 7.5 miles south of Floy Wash; about 1,000 feet west and 1,000 feet north of the southeast corner of sec. 16, T. 23 S., R. 18 E.

A1—0 to 2 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; weak thin platy structure; soft, very friable; few fine and very fine roots; common fine interstitial pores; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.

C1—2 to 16 inches; light reddish brown (5YR 6/4) sandy loam, yellowish red (5YR 4/6) moist; weak coarse and very coarse subangular blocky structure; soft, very friable; common very fine and fine roots and few medium roots; common fine and medium tubular pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

C2—16 to 19 inches; light reddish brown (5YR 6/4) sandy loam, yellowish red (5YR 4/6) moist; massive; soft, very friable; common very fine and fine roots and few medium roots; common fine and medium pores; 10 percent angular sandstone pebbles; very strongly calcareous; carbonates occur as thin flakes; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—19 inches; hard sandstone.

Bedrock is at a depth of 5 to 20 inches. Rock fragment content is less than 15 percent. The profile commonly is fine sandy loam, sandy loam, or loam. It has hue of 7.5YR, 5YR, or 2.5YR.

Moepitz Variant

The Moepitz Variant consists of deep, well drained, moderately rapidly permeable soils on alluvial fans below canyon walls. These soils formed in alluvium and colluvium derived from sandstone. Slopes are 2 to 10 percent. Elevation is 4,000 to 4,400 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 52 to 56 degrees F.

These soils are coarse-loamy, mixed (calcareous), mesic Typic Torriorthents.

Typical pedon of Moepitz Variant very stony sandy loam, 2 to 10 percent slopes, along the Colorado River, about 2,000 feet east and 2,000 feet north of the southwest corner of sec. 25, T. 24 S., R. 22 E.

C1—0 to 6 inches; reddish brown (2.5YR 5/4) very stony sandy loam, reddish brown (2.5YR 4/4) moist; weak thin platy structure; slightly hard, very friable, slightly sticky; few very fine and fine roots; many very fine and fine interstitial pores; 10 percent stones, 5

percent cobbles, and 15 percent pebbles in horizon and 5 percent stones, 18 percent cobbles, and 25 percent pebbles on surface; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear wavy boundary.

C2—6 to 12 inches; light reddish brown (2.5YR 6/4) cobbly coarse sandy loam, reddish brown (2.5YR 4/4) moist; weak fine and very fine subangular blocky structure; soft, very friable; many very fine and fine roots and few medium roots; common fine and medium tubular pores; 8 percent stones, 25 percent cobbles, and 15 percent pebbles; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear irregular boundary.

C3—12 to 30 inches; light reddish brown (2.5YR 6/4) coarse sandy loam, reddish brown (2.5YR 4/4) moist; massive; soft, very friable; common very fine and fine roots; common fine and medium tubular pores; 5 percent pebbles; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C4—30 to 45 inches; light reddish brown (2.5YR 6/4) coarse sandy loam, reddish brown (2.5YR 4/4) moist; massive; soft, very friable; few very fine and fine roots; common fine and medium pores; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); abrupt wavy boundary.

R—45 inches; sandstone.

Bedrock is at a depth of 40 to 60 inches. The particle size control section is 15 to 35 percent rock fragments.

The A horizon, where present, is very stony sandy loam, cobbly sandy loam, fine sandy loam, or very gravelly loamy sand. It has hue of 5YR, 2.5YR, or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 4 to 6. It is moderately alkaline or strongly alkaline and is slightly calcareous or moderately calcareous.

The C horizon is cobbly coarse sandy loam, sandy loam, coarse sandy loam, or fine sandy loam with thin strata of loamy sand, gravelly loamy sand, or gravelly coarse loamy sand. It has hue of 5YR, 2.5YR, or 10R, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 4 to 6. It is moderately alkaline or strongly alkaline and is slightly calcareous or moderately calcareous.

The Moepitz Variant soils differ from those in the Moepitz series by having sandstone at a depth of 40 to 60 inches.

Muff Family

The Muff family consists of moderately deep, well drained, slowly permeable soils on hills. These soils formed in colluvium, alluvium, and residuum derived from shale. Slopes are 1 to 50 percent. Elevation is 4,000 to 4,700 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 55 degrees F.

These soils are fine-loamy, mixed, mesic Typic Natrargids.

Reference pedon of a Muff family soil in an area of Muff family-Badland complex, about 4 miles south of Interstate 70 and 8 miles east of Cisco, about 1,250 feet north and 2,000 feet west of the southeast corner of sec. 25, T. 20 S., R. 24 E.

A1—0 to 3 inches; reddish brown (5YR 5/4) very bouldery fine sandy loam, reddish brown (5YR 5/3) moist; weak medium platy structure; soft, very friable; many very fine and fine roots, common medium roots, and few coarse roots; common fine tubular pores; 2 percent boulders, 7 percent stones, 10 percent cobbles, and 25 percent pebbles on surface and 5 percent pebbles in horizon; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

B21t—3 to 7 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm, sticky and plastic; common very fine, fine, and medium roots and few coarse roots; few fine tubular pores; common moderately thick clay films lining pores; 5 percent gravel; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); clear smooth boundary.

B22t—7 to 12 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; strong medium subangular blocky structure; hard, very firm, sticky and plastic; common very fine and fine roots and few medium and coarse roots; few fine tubular pores; common moderately thick clay films lining pores; 3 percent pebbles; moderately calcareous; carbonates are disseminated; very strongly alkaline (pH 9.4); clear smooth boundary.

B23t—12 to 23 inches; reddish brown (5YR 5/3) sandy clay loam, reddish brown (5YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few fine tubular pores; few thin clay films lining pores; moderately calcareous; carbonates are disseminated; very strongly alkaline (pH 9.2); clear wavy boundary.

C1—23 to 29 inches; pink (5YR 7/3) sandy clay loam, reddish brown (5YR 5/3) moist; massive; hard, firm, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few fine tubular pores; strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); diffuse broken boundary.

Cr—29 inches; weathered shale.

Paralithic contact is at a depth of 20 to 40 inches.

The A horizon is cobbly silt loam, very bouldery fine sandy loam, stony fine sandy loam, fine sandy loam, or silt loam. It is moderately alkaline or strongly alkaline and is slightly calcareous to strongly calcareous.

The B horizon is sandy clay loam, clay loam, or silt loam. It is moderately calcareous or strongly calcareous.

The C horizon is clay loam, silty clay loam, or sandy clay loam. It is moderately calcareous to very strongly calcareous.

Myton Family

The Myton family consists of moderately deep and deep, well drained, moderately rapidly permeable soils on canyonsides. These soils formed in colluvium and residuum derived from sandstone. Slopes are 50 to 70 percent. Elevation is 4,000 to 5,700 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 52 to 56 degrees F.

These soils are loamy-skeletal, mixed (calcareous), mesic Typic Torriorthents.

Reference pedon of a Myton family soil, 50 to 70 percent slopes, in an area of Myton family-Rock outcrop complex; in Moab Canyon, about 1,500 feet east and 2,000 feet south of the northwest corner of sec. 18, T. 25 S., R. 21 E.

C1—0 to 29 inches; reddish brown (2.5YR 4/4) extremely stony sandy loam, dark red (2.5YR 3/6) moist; massive; soft, friable; few very fine, fine, and medium roots; few fine tubular pores; 1 percent boulders, 20 percent stones, 35 percent cobbles, and 30 percent pebbles; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); abrupt irregular boundary.
R—29 inches; sandstone.

Bedrock is at a depth of 20 to 60 inches or more. The particle size control section is 35 to 80 percent rock fragments. The profile is extremely stony, very stony, extremely bouldery, very bouldery, extremely cobbly, or very cobbly sandy loam, sandy clay loam, loam, or clay loam. It has hue of 2.5YR to 10YR. It is moderately alkaline or strongly alkaline.

Nakai Series

The Nakai series consists of deep, well drained, moderately rapidly permeable soils on canyon floors and structural benches. These soils formed in eolian material and alluvium derived dominantly from sandstone. Slopes are 1 to 10 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 56 degrees F.

These soils are coarse-loamy, mixed, mesic Typic Calciorthids.

Typical pedon of a Nakai loamy fine sand, 1 to 8 percent slopes, in an area of Nakai-Redlands complex; about 12 miles south and 2 miles west of Floy Wash and Interstate 70; about 1,800 feet east and 1,500 feet south of the northwest corner of sec. 31, T. 23 S., R. 18 E.

A1—0 to 3 inches; reddish yellow (5YR 6/6) loamy fine sand, yellowish red (5YR 4/6) moist; weak thin platy structure; soft, very friable; common very fine roots and many fine and medium roots; common fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.2); clear wavy boundary.
B21—3 to 10 inches; red (2.5YR 5/6) fine sandy loam, dark reddish brown (2.5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable; many fine roots and common very fine and medium roots; common very fine and fine tubular pores; 1 percent pebbles; moderately calcareous; carbonates occur as few soft masses; moderately alkaline (pH 8.2); abrupt wavy boundary.
B22ca—10 to 22 inches; red (2.5YR 5/6) fine sandy loam, dark red (2.5YR 3/6) moist; weak medium subangular blocky structure; slightly hard, firm; common very fine and fine roots and few medium roots; many fine tubular pores; 1 percent pebbles; moderately calcareous; carbonates occur as common fine soft masses; moderately alkaline (pH 8.2); clear wavy boundary.
C1ca—22 to 33 inches; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, firm; common very fine roots; many fine tubular pores; 2 percent angular gravel; moderately calcareous; carbonates occur as soft masses and as coatings on the underside of pebbles; moderately alkaline (pH 8.2); clear wavy boundary.
C2ca—33 to 51 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 4/4) moist; massive; slightly hard, firm; common very fine roots; common fine tubular pores; moderately calcareous; carbonates occur as many medium soft masses; strongly alkaline (pH 8.6); abrupt wavy boundary.
R—51 inches; sandstone.

Bedrock is at a depth of 40 to 60 inches.

The A horizon is very fine sandy loam, fine sandy loam, or loamy fine sand. It has hue of 7.5YR, 5YR, or 2.5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 3 to 6.

The B horizon is very fine sandy loam, loam, or fine sandy loam. It has hue of 7.5YR, 5YR, or 2.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 4 to 6.

The C horizon is fine sandy loam or very fine sandy loam. It has hue of 7.5YR, 5YR, or 2.5YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 3 to 6. It is strongly alkaline or very strongly alkaline.

Neiber Series

The Neiber series consists of moderately deep, well drained, moderately slowly permeable soils on shale pediments, hogbacks, and structural benches. These soils formed in residuum and alluvium derived from sandstone and shale. Slopes are 2 to 15 percent. Elevation is 4,300 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 50 to 55 degrees F.

These soils are fine-loamy, mixed, mesic Typic Haplargids.

Typical pedon of a Neiber silt loam, 2 to 15 percent slopes, in an area of Blueflat-Neiber complex; about 2 miles northwest of the exit for Westwater Creek from Interstate 70, about 1,500 feet west and 1,000 feet south of the northeast corner of sec. 26, T. 19 S., R. 24 E.

A1—0 to 3 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; moderate thin platy structure; soft, friable; many very fine and fine roots and common medium roots; common fine and medium pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); clear smooth boundary.

B21t—3 to 7 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; many very fine and fine roots and common medium roots; common fine and medium pores; few thin patchy clay films lining pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); gradual smooth boundary.

B22t—7 to 12 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure parting to strong fine subangular blocky; slightly hard, firm, sticky and slightly plastic; common very fine, fine, and medium roots; common fine and medium tubular pores; common thin patchy clay films lining pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); gradual smooth boundary.

C1ca—12 to 20 inches; light gray (10YR 7/2) silty clay loam, pale brown (10YR 6/3) moist; moderate medium subangular blocky structure parting to moderate fine subangular blocky; hard, firm, sticky and slightly plastic; common very fine, fine, and medium roots; common fine and medium tubular pores; 5 percent soft shale fragments that slake in water; strongly calcareous; carbonates are disseminated and in thin veins in pores; strongly alkaline (pH 8.8); abrupt smooth boundary.

C1cs—20 to 27 inches; white (10YR 8/2) silty clay loam, light yellowish brown (2.5YR 6/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common fine and medium tubular pores; 30 percent soft shale fragments that slake in water; common soft masses of gypsum; strongly calcareous; carbonates are disseminated; mildly alkaline (pH 7.6); clear wavy boundary.

C2cs—27 to 32 inches; light gray (2.5YR 7/2) silty clay loam, light yellowish brown (2.5YR 6/4) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; common very fine, fine, and medium roots; few fine tubular pores; 60 percent shale fragments that slake in water; common soft masses of gypsum; moderately calcareous; carbonates are disseminated; mildly alkaline (pH 7.6); clear wavy boundary.

Cr—32 inches; shale; roots matted on top of bedrock.

Paralithic contact is at a depth of 20 to 40 inches. The solum is 7 to 20 inches thick.

The A horizon is silt loam, loam, or sandy clay loam. From 5 to 15 percent of surface is covered with rock fragments, mainly pebbles and channers of sandstone or siltstone. The horizon has hue of 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4.

The B horizon is silty clay loam, silt loam, or clay loam. It has hue of 7.5YR or 10YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 2 to 4.

The C horizon is silty clay loam or clay loam. It has hue of 10YR or 2.5Y, value of 5 to 8 when dry and 3 to 6 when moist, and chroma of 2 to 4. It is mildly alkaline or moderately alkaline. It generally has some soft masses of gypsum.

Pastern Series

The Pastern series consists of very shallow and shallow, well drained, moderately permeable soils on pediments and structural benches. These soils formed in alluvial and eolian material derived dominantly from sandstone and conglomerate. Slopes are 2 to 10 percent. Elevation is 5,000 to 5,500 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 50 to 54 degrees F.

These soils are loamy, mixed, mesic, shallow Ustollic Paleorthids.

Typical pedon of a Pastern fine sandy loam, 2 to 10 percent slopes, in an area of Factory-Pastern fine sandy loams, about 1.5 miles south of Dubinky Well, about 1,000 feet east and 100 feet north of the southwest corner of sec. 36, T. 24 S., R. 18 E.

A1—0 to 1 inch; reddish brown (5YR 5/4) fine sandy loam, reddish brown (5YR 4/4) moist; moderate fine and very fine subangular blocky structure parting to moderate very fine granular; soft, very friable; common fine and very fine roots; many very fine interstitial pores; 35 percent pebbles on surface and 8 percent angular pebbles in horizon; strongly

calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

B2—1 to 5 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; moderate coarse and very coarse prismatic structure parting to weak medium and coarse subangular blocky; slightly hard, very friable, slightly sticky; common very fine and fine roots and few coarse roots; common very fine and fine tubular pores and few coarse tubular pores; 5 percent angular pebbles; strongly calcareous; carbonates occur as coatings on undersides of pebbles; moderately alkaline (pH 8.2); clear wavy boundary.

B3—5 to 13 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky; common very fine and fine roots and few coarse roots; common very fine and fine tubular pores and few coarse tubular pores; 7 percent angular pebbles; very strongly calcareous; carbonates occur as coatings on undersides of pebbles; moderately alkaline (pH 8.2); clear wavy boundary.

C1ca—13 to 18 inches; pink (5YR 7/4) gravelly fine sandy loam, reddish yellow (5YR 6/6) moist; massive; slightly hard, very friable, slightly sticky; few very fine and coarse roots; common very fine and fine tubular pores and few coarse tubular pores; 20 percent pebbles, including pockets that are as much as 40 percent pebbles; very strongly calcareous; carbonates are disseminated and weakly cemented in places; moderately alkaline (pH 8.4); abrupt wavy boundary.

C2cam—18 inches; pinkish white (5YR 8/2) calcium-cemented hardpan; roots matted on top of hardpan.

The calcium-cemented hardpan is at a depth of 7 to 20 inches. The hardpan ranges from 6 to 36 inches thick. The particle size control section is 5 to 30 percent rock fragments. As much as 35 percent, by volume, rock fragments of hard caliche, sandstone, or chert on surface and as much as 30 percent in the C horizon.

The A horizon is fine sandy loam or gravelly fine sandy loam. It has hue of 7.5YR or 5YR. It is slightly calcareous or moderately calcareous.

The B horizon has hue of 7.5YR or 5YR, value of 5 or 6 when dry and 4 when moist, and chroma of 4 to 6. It is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

The C horizon is fine sandy loam, gravelly fine sandy loam, or gravelly loam. It has hue of 7.5YR, 5YR, or 2.5YR, value of 5 to 8 when dry and 4 to 7 when moist, and chroma of 3 to 6. It is moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous.

Pennell Series

The Pennell series consists of very shallow and shallow, well drained, moderately permeable soils on benches and cuestas. These soils formed in residuum derived from sandstone. Slopes are 3 to 15 percent. Elevation is 5,000 to 5,400 feet. Average annual precipitation is 7 to 9 inches, and mean annual air temperature is 49 to 51 degrees F.

These soils are loamy, mixed, mesic Lithic Calciorthids.

Typical pedon of Pennell sandy loam, 3 to 15 percent slopes; east of Green River and west of Horse Canyon, in the Book Cliffs; about 2,250 feet south and 1,500 feet east of the northwest corner of sec. 24, T. 19 S., R. 17 E.

A1—0 to 4 inches; brown (7.5YR 5/4) sandy loam, brown (7.5YR 4/4) moist; weak fine granular structure; soft, very friable; 20 to 40 percent of surface covered with pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.

B2—4 to 7 inches; brown (7.5YR 5/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, friable, slightly plastic; few very fine, fine, and medium roots; 5 percent pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); clear smooth boundary.

C1ca—7 to 13 inches; pink (7.5YR 7/4) gravelly sandy clay loam, light brown (7.5YR 6/4) moist; massive; soft, friable, slightly plastic; few fine roots; 20 percent pebbles; strongly calcareous; carbonates occur as moderately thick pendants on rock fragments; moderately alkaline (pH 8.2); abrupt smooth boundary.

R—13 inches; sandstone.

A layer of secondary carbonate accumulation is at a depth of 3 to 7 inches. Clay content is 10 to 27 percent. Bedrock is at a depth of 8 to 20 inches.

The A horizon has hue of 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 6. It is gravelly sandy clay loam, very gravelly fine sandy loam, fine sandy loam, or gravelly loam.

The B2 horizon, where present, has value of 5 or 6 when dry and 4 or 5 when moist, and it has chroma of 2 to 4. It is fine sandy loam or loam. It is moderately alkaline or strongly alkaline.

The Cca horizon has value of 6 to 8 when dry and 5 to 7 when moist, and it has chroma of 2 to 4. It is gravelly sandy clay loam or loam. It is moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous. Calcium carbonates occur as pendants on rock fragments or as soft masses.

Plite Family

The Plite family consists of very deep, well drained, moderately rapidly permeable soils on stream terraces and in canyons. These soils formed in alluvium derived dominantly from sandstone. Slopes are 1 to 8 percent. Elevation is 6,700 to 8,000 feet. Average annual precipitation is 14 to 20 inches, and mean annual air temperature is 39 to 43 degrees F.

These soils are coarse-loamy, mixed Cumulic Haploborolls.

Reference pedon of a Plite family soil in an area of Firth-Plite families association, near Tepee Canyon, about 900 feet north and 1,900 feet west of the southeast corner of sec. 27, T. 18 S., R. 21 E.

O1—2 inches to 0; partially decomposed leaves, twigs, and needles.

A11—0 to 4 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine granular; loose; many very fine and fine roots and few medium and coarse roots; common fine pores; neutral (pH 7.0); clear smooth boundary.

A12—4 to 12 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine granular; loose; common very fine, fine, and medium roots; common fine pores; neutral (pH 7.2); clear wavy boundary.

B2—12 to 20 inches; dark brown (10YR 3/3) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; soft, very friable; few very fine roots and common fine, medium, and coarse roots; common fine pores; 5 percent pebbles; neutral (pH 7.2); clear smooth boundary.

C1—20 to 42 inches; brown (7.5YR 5/4) sandy loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, very friable, few very fine roots and common fine, medium, and coarse roots; common fine pores; neutral (pH 7.2); clear smooth boundary.

C2—42 to 60 inches; dark brown (7.5YR 4/4) loam, dark brown (7.5YR 3/2) moist; massive; slightly hard, very friable; few fine, medium, and coarse roots; 10 percent cobbles; mildly alkaline (pH 7.6).

Bedrock is at a depth of more than 60 inches. The mollic epipedon is more than 16 inches thick. In some areas the mollic epipedon is covered by an overwash of lighter colored material. The particle size control section is 0 to 20 percent rock fragments. The profile is sandy loam, loam, fine sandy loam, or gravelly loam. It is neutral to mildly alkaline and is noncalcareous to moderately calcareous.

Ravola Family

The Ravola family consists of very deep, well drained, moderately slowly permeable soils along drainageways and on flood plains. These soils formed in alluvium derived from shale. Slopes are 0 to 3 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 56 degrees F.

These soils are fine-silty, mixed (calcareous), mesic Typic Torrifluvents.

Reference pedon of a Ravola family soil in an area of Toddler-Ravola-Glenton families association, about 3 miles east of Valley City Reservoir, about 2,000 feet south and 2,000 feet west of the northeast corner of sec. 19, T. 22 S., R. 20 E.

A1—0 to 3 inches; reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/4) moist; weak medium and thick platy structure; slightly hard, very friable, slightly sticky; many very fine and fine roots; many very fine and fine tubular pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

C1—3 to 7 inches; reddish brown (5YR 5/3) silt loam, reddish brown (5YR 4/4) moist; massive; slightly hard, very friable, slightly sticky; many very fine and fine roots; many very fine and fine tubular pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

C2—7 to 10 inches; light reddish brown (5YR 6/4) fine sandy loam, reddish brown (5YR 4/4) moist; massive; soft, very friable; many very fine and fine roots; many very fine tubular pores; very strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

C3—10 to 29 inches; reddish brown (5YR 5/4) silt loam, reddish brown (5YR 4/4) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, sticky and slightly plastic; many very fine roots; many very fine tubular pores; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); clear smooth boundary.

C4—29 to 60 inches; light brown (7.5YR 6/4) silt loam, brown (7.5YR 4/4) moist; weak medium and coarse subangular blocky structure; slightly hard, very friable, sticky; many very fine roots; many very fine tubular pores; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0).

Bedrock is at a depth of 60 inches or more.

The A horizon is silt loam, loam, or silty clay loam. It has hue of 5YR to 2.5Y. It is moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous.

The C horizon is silt loam or silty clay loam and has thin strata of fine sandy loam, loamy fine sand, silt, or sandy clay loam. It has hue of 5YR to 2.5Y. It is

moderately alkaline or strongly alkaline and is moderately calcareous to very strongly calcareous.

Razorba Family

The Razorba family consists of deep and very deep, well drained, moderately permeable soils on mountainsides. These soils formed in colluvium and residuum derived dominantly from sandstone and shale. Slopes are 50 to 80 percent. Elevation is 6,000 to 9,000 feet. Average annual precipitation is 16 to 24 inches, and mean annual air temperature is 35 to 42 degrees F.

These soils are coarse-loamy, mixed Pachic Cryoborolls.

Reference pedon of a Razorba family soil in an area of Sula-Razorba families complex, near Flatnose George Canyon, about 1,000 feet north and 4,000 feet west of the northwest corner of sec. 22, T. 18 S., R. 19 E., in an area that does not have a cadastral survey:

O1—3 inches to 0; partially decomposed leaves and twigs.

A11—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots and few coarse roots; slightly acid (pH 6.4); clear smooth boundary.

A12—8 to 20 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; few fine, medium, and coarse roots; few fine and very fine pores; slightly acid (pH 6.4); clear smooth boundary.

B2—20 to 39 inches; dark brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; soft, very friable; few fine and medium roots; common fine pores and few very fine and medium pores; slightly acid (pH 6.4); clear smooth boundary.

B3—39 to 47 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; soft, very friable; few fine and medium roots; neutral (pH 6.6); clear smooth boundary.

C1—47 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable; 10 percent pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2).

Bedrock is at a depth of 40 to 60 inches or more. The mollic epipedon is 17 to 60 inches thick. The particle size control section is 0 to 35 percent rock fragments.

The A horizon is sandy loam, loam, stony loam, gravelly loam, or fine sandy loam. It has hue of 2.5Y to 5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma is 1 to 3. It is slightly acid to moderately alkaline.

The B horizon, where present, is fine sandy loam, sandy loam, loam, gravelly sandy loam, gravelly loam, channery sandy loam, or channery loam. It has hue of 2.5YR to 5Y, value of 3 or 5 when dry and 3 when moist, and chroma of 2 to 3. It is neutral to moderately alkaline.

The C horizon is gravelly loam, loam, channery loam, sandy loam, or fine sandy loam. In some pedons very gravelly sandy loam, very gravelly sandy clay loam, or silt loam is below a depth of 40 inches. The horizon has hue of 5Y to 5YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 2 to 6. It is neutral to moderately alkaline.

Redbank Family

The Redbank family consists of very deep, well drained, moderately rapidly permeable soils on flood plains and valley floors. These soils formed in alluvium derived dominantly from sandstone and shale. Slopes are 0 to 3 percent. Elevation is 4,000 to 6,000 feet. Average annual precipitation is 5 to 12 inches, and mean annual air temperature is 47 to 55 degrees F. At elevations below about 4,800 feet, these soils are along major stream channels where additional moisture is provided by runon or subirrigation.

These soils are coarse-loamy, mixed (calcareous), mesic Ustic Torrifluvents.

Reference pedon of a Redbank family soil in an area of Redbank-Flatnose families association; about 1 mile east of Dewey Bridge, along the Colorado River; about 500 feet north and 1,000 feet east of the southwest corner of sec. 8, T. 23 S., R. 24 E.

A1—0 to 8 inches; reddish brown (2.5YR 5/4) fine sandy loam, dark reddish brown (2.5YR 3/4) moist; weak thick platy structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt wavy boundary.

C1—8 to 13 inches; reddish brown (5YR 4/4) sandy loam, dark red (2.5YR 3/6) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear wavy boundary.

C2—13 to 24 inches; red (2.5YR 4/6) gravelly loamy coarse sand, reddish brown (2.5YR 4/4) moist; single grain; loose; common very fine, fine, and medium roots; few very fine and fine tubular pores; 20 percent pebbles; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); clear smooth boundary.

C3—24 to 46 inches; red (2.5YR 4/6) sandy loam, dark red (2.5YR 3/6) moist; massive; soft, very friable,

slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular pores; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 9.0); clear smooth boundary.

C4—46 to 60 inches; red (2.5Y 4/6) loamy coarse sand, red (2.5YR 4/6) moist; single grain; loose; few very fine and fine roots; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2).

Bedrock is at a depth of 60 inches or more. The particle size control section is 0 to 35 percent rock fragments.

The A horizon is fine sandy loam, sandy clay loam, or very fine sandy loam. It has hue of 2.5YR to 2.5Y, value of 4 to 6 when dry and 2 to 5 when moist, and chroma of 2 to 4. In areas where the surface is dark, it is not thick enough to qualify as a mollic epipedon. The horizon is mildly alkaline or moderately alkaline and is slightly calcareous or strongly calcareous.

The C horizon is sandy loam, loam, cobbly loam, fine sandy loam, or stony sandy loam with thin strata of gravelly loamy coarse sand, very stony silt loam, loamy coarse sand, or sand. It has hue of 2.5YR to 2.5Y, value of 4 to 6 when dry and 3 to 6 when moist, and chroma of 2 to 6. It is moderately alkaline or strongly alkaline and is slightly calcareous or moderately calcareous.

Redlands Series

The Redlands series consists of deep, well drained, moderately permeable soils on structural benches and canyon floors. These soils formed in eolian material and some alluvium derived dominantly from sandstone. Slopes are 3 to 10 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 55 degrees F.

These soils are fine-loamy, mixed, mesic Typic Haplargids.

Typical pedon of Redlands fine sandy loam, 3 to 10 percent slopes, in an area of Nakai-Redlands complex, about 5 miles north and 6 miles west of Dubinky Well, about 750 feet east and 500 feet north of the southwest corner of sec. 31, T. 23 S., R. 18 E.

A1—0 to 8 inches; reddish brown (2.5YR 5/4) fine sandy loam, reddish brown (2.5YR 4/4) moist; moderate medium subangular blocky structure; soft, friable; many fine and few medium roots; many medium and fine vesicular pores; slightly calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

B2t—8 to 14 inches; reddish brown (2.5YR 5/4) sandy clay loam, reddish brown (2.5YR 4/4) moist; strong fine subangular blocky structure; slightly hard, firm, sticky and plastic; many very fine and fine roots and few medium roots; common fine and very fine tubular pores; few thin clay films bridging sand grains; moderately calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

B3—14 to 43 inches; red (2.5YR 4/6) fine sandy loam, dark red (2.5YR 3/6) moist; weak medium subangular blocky structure; slightly hard, firm; common very fine roots; many very fine, fine, and medium pores; slightly calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

C—43 to 59 inches; light reddish brown (2.5YR 6/4) fine sandy loam, reddish brown (2.5YR 4/4) moist; massive; slightly hard, firm; few very fine roots; common medium and fine tubular pores; moderately calcareous; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—59 inches; sandstone.

The profile has hue of 5YR or 2.5YR. Bedrock is at a depth of 40 to 60 inches.

The A horizon is loamy fine sandy or fine sandy loam.

The B horizon is sandy clay loam or fine sandy loam.

Reva Family

The Reva family consists of very shallow and shallow, well drained, moderately rapidly permeable soils on canyon escarpments and mountainsides. These soils formed in colluvium and residuum derived dominantly from sandstone. Slopes are 50 to 80 percent. Elevation is 5,900 to 8,600 feet. Average annual precipitation is 12 to 16 inches, and mean annual air temperature is 39 to 44 degrees F.

These soils are loamy-skeletal, mixed (calcareous), frigid Lithic Ustorthents.

Reference pedon of a Reva family soil, 50 to 80 percent slopes, in an area of Reva-Falcon families-Rock outcrop complex, in Diamond Canyon, about 500 feet south and 7,500 feet east of the southeast corner of sec. 2, T. 18 S., R. 23 E., in an area that does not have a cadastral survey:

C1—0 to 2 inches; light yellowish brown (10YR 6/4) very bouldery sandy loam, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure parting to single grain; soft, very friable; few very fine and fine roots; common fine interstitial pores; 2 percent boulders, 5 percent stones, 5 percent channers, and 15 percent pebbles on surface and 5 percent pebbles in horizon; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.

C2—2 to 4 inches; yellowish brown (10YR 5/6) fine sandy loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure; soft, friable; common very fine and few fine roots; few very fine and fine tubular pores; 5 percent pebbles; strongly calcareous; carbonates are disseminated;

moderately alkaline (pH 8.4); abrupt smooth boundary.
C3—4 to 8 inches; light yellowish brown (10YR 6/4) extremely channery sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm; few very fine, fine, and medium roots; few very fine and fine pores; 50 percent channers and 20 percent pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt irregular boundary.
R—8 inches; sandstone.

Bedrock is at a depth of 3 to 20 inches. The particle size control section is 35 to 80 percent rock fragments.

The profile is extremely channery sandy loam, very bouldery sandy loam, extremely bouldery sandy loam, or very channery loam with some thin strata of fine sandy loam, channery fine sandy loam, or sandy loam. It has hue of 5Y to 5YR, value of 4 to 6 when dry and 4 or 5 when moist, and chroma of 2 to 6. It is mildly alkaline or moderately alkaline and is moderately calcareous to very strongly calcareous.

Rizno Series

The Rizno series consists of very shallow and shallow, well drained, moderately rapid permeable soils on cuesta tops and structural benches. These soils formed in alluvial and eolian material derived dominantly from sandstone. Slopes are 2 to 20 percent. Elevation is 4,700 to 6,400 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 47 to 54 degrees F.

These soils are loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents.

Typical pedon of a Rizno fine sandy loam, 2 to 10 percent slopes, in an area of Rizno-Rock outcrop complex, about 8 miles northeast of Dead Horse Point State Park, about 500 feet east and 500 feet north of the southwest corner of sec. 22, T. 25 S., R. 19 E.

A1—0 to 2 inches; light red (2.5YR 6/6) fine sandy loam, reddish brown (2.5YR 4/4) moist; weak medium platy structure; soft, very friable; few medium and coarse roots; many medium interstitial pores; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); clear smooth boundary.
C1—2 to 8 inches; red (2.5YR 5/6) gravelly fine sandy loam, reddish brown (2.5YR 4/4) moist; weak fine subangular blocky structure; slightly hard, very friable; many very fine, fine, and medium roots and few coarse roots; many very fine, fine, and medium tubular pores; 25 percent angular pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); abrupt smooth boundary.
R—8 inches; calcareous sandstone.

Bedrock is at a depth of 4 to 20 inches. The particle size control section is 5 to 35 percent rock fragments.

The A horizon, where present, is sandy loam, fine sandy loam, or gravelly fine sandy loam. It has hue of 2.5YR or 5YR.

The C horizon is gravelly fine sandy loam, channery fine sandy loam, or fine sandy loam. It has hue of 2.5YR or 5YR. It is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

Sagers Series

The Sagers series consists of very deep, well drained, moderately slowly permeable soils on valley floors and plains. These soils formed in alluvium derived from Mancos shale. Slopes are 1 to 3 percent. Elevation is 4,500 to 4,900 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 50 to 55 degrees F.

These soils are fine-silty, mixed (calcareous), mesic Typic Torriorthents.

Typical pedon of Sagers silt loam, about 3 miles southeast of the intersection of Yellowcat Road and Interstate 70, about 2,500 feet east and 1,000 feet south of the northwest corner of sec. 2, T. 22 S., R. 21 E.

A1—0 to 8 inches; pale brown (10YR 6/3) silt loam, brown (10YR 4/3) moist; moderate medium and thin platy structure; soft, friable, slightly sticky and slightly plastic; few fine and medium roots; many very fine and fine interstitial pores; moderately calcareous; strongly alkaline (pH 8.8); clear wavy boundary.
C1—8 to 18 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable sticky and plastic; many very fine and fine roots; many very fine and fine tubular pores; moderately calcareous; strongly alkaline (pH 9.0); gradual smooth boundary.
C2—18 to 40 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots and few medium roots; many very fine and fine tubular pores; strongly calcareous; carbonates occur as common soft masses and seams; strongly alkaline (pH 8.6); clear smooth boundary.
C3—40 to 60 inches; pale brown (10YR 6/3) silty clay loam, brown (10YR 5/3) moist; massive; hard, friable, sticky and plastic; few very fine and fine roots; many very fine and fine tubular pores; moderately calcareous; carbonates occur as common veins and soft masses; moderately alkaline (pH 8.4).

Paralithic contact is at a depth of more than 60 inches.

The A horizon is silt loam or silty clay loam. It has hue of 10YR or 2.5Y, value of 5 or 6 when dry, and chroma of 2 or 3. It is moderately alkaline or strongly alkaline.

The C horizon is silt loam or silty clay loam. It has hue of 10YR or 2.5Y, value of 5 to 7 when dry, and chroma of 2 or 3. It is moderately alkaline or strongly alkaline.

Sandoval Series

The Sandoval series consists of shallow, well drained, moderately slowly permeable soils on shale pediments. These soils formed in residuum and alluvium derived from Mancos shale. Slopes are 3 to 15 percent. Elevation is 4,700 to 5,900 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 46 to 54 degrees F.

These soils are loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents.

Typical pedon of a Sandoval silt loam, 3 to 15 percent slopes, in an area of Sandoval-Killpack complex, about 1.5 miles south of Big Hole; about 2,000 feet west and 2,500 feet south of the northeast corner of sec. 12, T. 20 S., R. 21 E.

A1—0 to 2 inches; light brownish gray (2.5Y 6/2) silt loam, grayish brown (2.5Y 5/2) moist; moderate thin platy structure; soft, very friable, slightly sticky and plastic; few very fine roots; common very fine and fine pores; 5 percent pebbles on surface; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1—2 to 6 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; soft, friable, slightly sticky and plastic; few very fine and fine roots; common very fine and fine tubular pores; 30 percent soft shale fragments that slake in water; common soft masses of gypsum; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.

C2—6 to 11 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine and fine roots; common very fine and fine tubular pores; 60 percent soft shale fragments that slake in water; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); clear smooth boundary.

C3—11 to 18 inches; light brownish gray (2.5Y 6/2) silt loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable, slightly sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; 90 percent soft shale fragments that slake in water; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt wavy boundary.

Cr—18 inches; partially weathered shale.

Paralithic contact is at a depth of 10 to 20 inches.

The A horizon, where present, is loam, silt loam, or gravelly loam. It has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6 when dry and 5 when moist, and chroma of 2 to 4.

The C horizon is silty clay loam, clay loam, silt loam, or loam. It has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6 when dry and 4 to 6 when moist, and chroma of 2 to 4. It is moderately alkaline or strongly alkaline and is moderately calcareous or strongly calcareous.

Sazi Series

The Sazi series consists of moderately deep, well drained, moderately rapidly permeable soils on broad cuestas and structural benches. These soils formed in eolian and alluvial material derived from sandstone. Slopes are 2 to 20 percent. Elevation is 4,700 to 6,300 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 48 to 54 degrees F.

These soils are coarse-loamy, mixed, mesic Ustollic Calciorthids.

Typical pedon of Sazi fine sandy loam, dry, 2 to 10 percent slopes, in an area of Begay-Sazi complex; about 5 miles north and 2.5 miles west of Dead Horse Point; about 1,800 feet west and 1,900 feet south of the northeast corner of sec. 14, T. 26 S., R. 19 E., in an area that does not have a cadastral survey:

A1—0 to 4 inches; strong brown (7.5YR 5/6) fine sandy loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, very friable; common very fine, fine, and medium roots; common fine and very fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.2); clear wavy boundary.

B21—4 to 11 inches; yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable; common very fine, fine, and medium roots; common very fine, fine, and medium tubular pores; strongly calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

B22—11 to 17 inches; yellowish red (5YR 5/6) fine sandy loam, reddish brown (5YR 4/4) moist; weak medium subangular blocky structure; slightly hard, friable; common very fine, fine, and medium roots; common very fine and fine tubular pores; strongly calcareous; strongly alkaline (pH 8.8); clear wavy boundary.

C1ca—17 to 26 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 5/4) moist; massive; hard, friable; common very fine and fine roots and few medium roots; common very fine and fine tubular pores and few medium tubular pores;

very strongly calcareous; carbonates are disseminated and occur as mycelia; strongly alkaline (pH 9.0); clear wavy boundary.

C2ca—26 to 34 inches; reddish yellow (5YR 6/6) fine sandy loam, reddish brown (5YR 5/4) moist; massive; hard, friable; common very fine and fine roots and few medium roots; common very fine and fine tubular pores and few medium tubular pores; very strongly calcareous; carbonates are disseminated and occur as mycelia; very strongly alkaline (pH 9.2); abrupt irregular boundary.

R—34 inches; sandstone.

The particle size control section is 8 to 18 percent clay. The solum is 5 to 17 inches thick. Bedrock is at a depth of 20 to 40 inches.

The A horizon has hue of 5YR and 7.5YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 3 to 6. It is fine sandy loam or gravelly loam. It is mildly alkaline or moderately alkaline.

The B horizon has hue of 7.5YR or 5YR, value of 4 to 7 when dry and 4 to 6 when moist, and chroma of 4 to 6. It is sandy loam or fine sandy loam. It is mildly alkaline to strongly alkaline.

The Cca horizon has hue of 2.5YR to 7.5YR, value of 5 to 8 when dry and 4 to 7 when moist, and chroma of 2 to 6. It is fine sandy loam, sandy loam, loam, very fine sandy loam, or channery sandy loam. It is moderately alkaline to very strongly alkaline and is strongly calcareous or very strongly calcareous.

Shalako Series

The Shalako series consists of shallow, well drained, moderately rapidly permeable soils on cuestas, mesas, mountainsides, and structural benches. These soils formed in residuum and alluvium derived from sandstone. Slopes are 1 to 30 percent. Elevation is 4,700 to 7,800 feet. Average annual precipitation is 8 to 16 inches, and mean annual air temperature is 45 to 54 degrees F.

These soils are loamy, mixed, mesic Lithic Ustollic Calciorthids.

Typical pedon of the Shalako gravelly sandy loam, 3 to 8 percent slopes, about 2 miles north and 8 miles west of Harley Dome, about 500 feet north and 2,500 west of the southeast corner of sec. 29, T. 18 S., R. 24 E.

A1—0 to 1 inch; light yellowish brown (10YR 6/4) gravelly sandy loam, yellowish brown (10YR 5/6) moist; weak thin platy structure; soft, friable; few very fine roots; common very fine and few fine pores; 15 percent channers and 30 percent pebbles on surface and 5 percent channers and 10 percent pebbles in horizon; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

B2—1 to 4 inches; light yellowish brown (10YR 6/4) fine sandy loam, yellowish brown (10YR 5/6) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly plastic; few very fine and fine roots; few very fine and fine pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.

C1ca—4 to 10 inches; very pale brown (10YR 7/4) gravelly loam, light yellowish brown (10YR 6/4) moist; massive; hard, firm, slightly plastic; few very fine roots; 15 percent pebbles and 5 percent channers; very strongly calcareous; carbonates occur as moderately thick pendants on underside of rock fragments; strongly alkaline (pH 8.6); abrupt smooth boundary.

R—10 inches; unweathered sandstone.

The particle size control section ranges from 7 to 18 percent clay. Bedrock is at a depth of 5 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 6. It is very fine sandy loam, sandy loam, gravelly sandy loam, or very stony fine sandy loam. It is mildly alkaline to strongly alkaline and is slightly calcareous to strongly calcareous.

The B horizon, where present, has hue of 7.5YR to 2.5Y, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 4 to 6. It commonly is fine sandy loam, loam, or sandy loam. It is moderately alkaline or strongly alkaline and is slightly calcareous or moderately calcareous.

The Cca horizon has hue of 7.5YR to 2.5Y, value of 4 to 8 when dry and 3 to 5 when moist, and chroma of 2 to 4. It is gravelly loam, sandy loam, gravelly very fine sandy loam, cobbly loam, or gravelly fine sandy loam. It is moderately alkaline to very strongly alkaline.

Shalet Series

The Shalet series consists of very shallow and shallow, well drained, moderately slowly permeable soils on structural benches and cuestas. These soils formed in residuum derived from sandstone and shale. Slopes are 3 to 10 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 55 degrees F.

These soils are loamy, mixed (calcareous), mesic, shallow Typic Torriorthents.

Typical pedon of Shalet loam, 3 to 10 percent slopes; about 14 miles southeast of Green River; about 1,000 feet east and 250 feet north of the southwest corner of sec. 10, T. 23 S., R. 17 E.

A1—0 to 3 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/4) moist; weak fine granular structure; soft, friable, slightly sticky and slightly

plastic; many fine and medium roots; many fine interstitial pores; moderately calcareous; moderately alkaline (pH 8.0); clear wavy boundary.
C1—3 to 7 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, firm, sticky and plastic; many fine and medium roots; many fine tubular pores; moderately calcareous; moderately alkaline (pH 8.0); abrupt wavy boundary.
Cr—7 to 15 inches; weathered fissile shale.

Paralithic contact is at a depth of 4 to 20 inches.

The A horizon, where present, is loam, clay loam, or fine sandy loam. It has hue of 7.5YR to 2.5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 4 to 6. It is slightly calcareous or moderately calcareous.

The C horizon is loam, clay loam, or sandy clay loam. It has hue of 5YR or 2.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 4 to 6. It is moderately alkaline or strongly alkaline and is slightly calcareous or moderately calcareous.

Sheppard Series

The Sheppard series consists of very deep, somewhat excessively drained, rapidly permeable soils on valley fills, structural benches, and alluvial fans. These soils formed in eolian material derived from sandstone. Slopes are 2 to 10 percent. Elevation is 4,000 to 4,800 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 55 degrees F.

These soils are mixed, mesic Typic Torripsamments.

Typical pedon of Sheppard fine sand, 2 to 10 percent slopes; about 13 miles south and 4 miles east of Cresent Junction; about 400 feet east and 700 feet north of the southwest corner of sec. 5, T. 24 S., R. 20 E.

C1—0 to 10 inches; reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6) moist; weak thin platy structure; very soft, very friable; common fine and very fine roots; few medium and coarse tubular pores; slightly calcareous; moderately alkaline (pH 8.0); gradual smooth boundary.
C2—10 to 26 inches; reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/6) moist; single grain; very soft, very friable; common fine medium and coarse roots; few fine and medium tubular pores; slightly calcareous; moderately alkaline (pH 8.4); diffuse smooth boundary.
C3—26 to 60 inches; reddish yellow (5YR 6/6) fine sand, yellowish red (5YR 4/4) moist; single grain; very soft, very friable; few fine and very fine roots; few very fine and fine tubular pores; slightly calcareous; moderately alkaline (pH 8.4).

Depth to bedrock is 60 inches or more. The profile is fine sand or loamy fine sand. It has hue of 2.5YR, 5YR, or 7.5YR.

The Sheppard soils in map unit 42 are a taxadjunct to the Sheppard series because they have hue of 10YR and are strongly alkaline in the lower part.

Skylick Series

The Skylick series consists of very deep, well drained, moderately slowly permeable soils on foot slopes of mountains. These soils formed in colluvium derived from sandstone and shale. Slopes are 8 to 30 percent. Elevation is 6,600 to 8,500 feet. Average annual precipitation is 16 to 23 inches, and mean annual air temperature is 37 to 42 degrees F.

These soils are fine-loamy, mixed Cryic Pachic Paleborolls.

Typical pedon of Skylick sandy loam, 8 to 30 percent slopes; about 2 miles north and 2.5 miles west of Nutters Hole; 3,000 feet south and 8,000 feet west of the southwest corner of sec. 22, T. 18 S., R. 19 E., in an area that does not have a cadastral survey:

O1—4 to 2 inches; undecomposed leaves and twigs.
O2—2 inches to 0; decomposed leaves and twigs.
A11—0 to 13 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; mildly alkaline (pH 7.8); clear smooth boundary.
A12—13 to 21 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium granular structure; soft, friable, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; common fine pores; mildly alkaline (pH 7.8); clear smooth boundary.
B1—21 to 30 inches; brown (10YR 5/3) sandy loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common thin and few moderately thick clay films bridging mineral grains; 5 percent pebbles; mildly alkaline (pH 7.8); clear smooth boundary.
B21t—30 to 36 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; strong medium subangular blocky structure; very hard, firm, sticky and slightly plastic; common thin clay films on faces of peds and lining pores; 5 percent pebbles; mildly alkaline (pH 7.8); clear smooth boundary.
B22t—36 to 60 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; moderate medium subangular blocky structure parting to weak coarse granular structure; slightly hard, firm, slightly sticky and slightly plastic; few thin patchy clay films lining pores and on faces of peds; mildly alkaline (pH 7.8).

The solum is neutral or mildly alkaline. The mollic epipedon is 21 to 47 inches thick. The argillic horizon is 15 to 38 inches thick and is 20 to 35 percent clay.

The A horizon has value of 3 or 4 when dry and 2 or 3 when moist, and it has chroma of 1 to 3. It is sandy loam or loam.

The B horizon has hue of 7.5YR to 2.5Y, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4. It is sandy loam, loam, or sandy clay loam.

Strych Series

The Strych series consists of very deep, well drained, moderately rapidly permeable soils on alluvial fans. These soils formed in alluvium derived dominantly from sandstone and conglomerate. Slopes are 1 to 8 percent. Elevation is 5,200 to 6,200 feet. Average annual precipitation is 9 to 13 inches, and mean annual air temperature is 46 to 50 degrees F.

These soils are loamy-skeletal, mixed, mesic Ustollic Calciorthids.

Typical pedon of Strych fine sandy loam, 1 to 8 percent slopes; about 2 miles northeast of the mouth of Nash Wash Canyon, in the Book Cliffs; about 500 feet south and 2,500 feet west of the northwest corner of sec. 11, T. 20 S., R. 21 E.

A1—0 to 1 inch; yellowish brown (10YR 5/4) fine sandy loam, brown (10YR 4/3) moist; weak thin platy structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; common very fine and fine interstitial pores; 10 percent pebbles and 5 percent stones on surface; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.

B2—1 to 6 inches; brown (10YR 5/3) fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine interstitial pores and few medium interstitial pores; 10 percent pebbles; slightly calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

B3ca—6 to 11 inches; pale brown (10YR 6/3) stony loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few very fine and fine roots and common medium and coarse roots; common very fine and fine tubular pores and few medium tubular pores; 15 percent pebbles, 5 percent stones, and 5 percent cobbles; moderately calcareous; carbonates are disseminated; strongly alkaline (pH 8.6); clear smooth boundary.

C1ca—11 to 25 inches; pale brown (10YR 6/3) very stony loam, brown (10YR 5/3) moist; massive; very hard, firm, slightly sticky and slightly plastic; few very fine, fine, medium, and coarse roots; few very fine tubular pores; 20 percent pebbles, 15 percent stones, and 5 percent cobbles; strongly calcareous; carbonates occur as common fine veins; strongly alkaline (pH 8.6); clear smooth boundary.

C2ca—25 to 48 inches; pale brown (10YR 6/3) very stony loam, yellowish brown (10YR 5/4) moist; massive; very hard, firm, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common very fine tubular pores; 20 percent cobbles, 20 percent stones, and 5 percent boulders; strongly calcareous; carbonates occur as few fine veins; strongly alkaline (pH 8.8); clear smooth boundary.

C3—48 to 60 inches; light yellowish brown (10YR 6/4) stony sandy loam, yellowish brown (10YR 5/4) moist; massive; hard, firm, slightly sticky and slightly plastic; few fine and medium roots; 10 percent stones and 5 percent pebbles; strongly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4).

Bedrock is at a depth of 60 inches or more. The particle size control section is 35 to 50 percent rock fragments, mainly stones and cobbles. It is 14 to 18 percent clay.

The A horizon has hue of 7.5YR or 10YR, value of 5 when dry and 4 when moist, and chroma of 3 to 6. It is mildly alkaline or moderately alkaline and is slightly calcareous or moderately calcareous.

The B horizon has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 6. It is moderately alkaline or strongly alkaline and is slightly calcareous to strongly calcareous.

The Cca horizon has hue of 7.5YR or 10YR, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 to 4. It is moderately alkaline or strongly alkaline.

Sula Family

The Sula family consists of moderately deep and deep, well drained, moderately permeable soils on mountainsides. These soils formed in colluvium and residuum derived dominantly from sandstone. Slopes are 50 to 80 percent. Elevation is 6,000 to 9,000 feet. Average annual precipitation is 16 to 24 inches, and mean annual air temperature is 35 to 42 degrees F.

These soils are coarse-loamy, mixed Typic Cryoborolls.

Reference pedon of a Sula family soil, 50 to 80 percent slopes, in an area of Sula-Razorba families complex, near Bear Canyon, about 3,500 feet south and 2,000 feet east of the northwest corner of sec. 23, T. 19 S., R. 21 E., in an area that does not have a cadastral survey:

O1—3 inches to 0; partially decomposed litter of leaves, twigs, and needles.

A1—0 to 3 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, very friable; few very fine and fine roots; few very fine and fine pores; 2 percent stones on surface; neutral (pH 7.0); abrupt wavy boundary.
B21—3 to 7 inches; dark brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; moderate fine granular structure; soft, friable; few very fine, fine, and medium roots; few very fine and fine pores; neutral (pH 7.0); clear smooth boundary.
B22—7 to 12 inches; dark yellowish brown (10YR 4/4) sandy loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to weak fine granular; soft, friable; few very fine, fine, and medium roots; common very fine and fine pores; neutral (pH 6.8); clear smooth boundary.
C1—12 to 18 inches; strong brown (7.5YR 4/6) loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine and fine pores; neutral (pH 6.8); gradual smooth boundary.
C2—18 to 22 inches; brown (7.5YR 4/4) loam, dark brown (7.5YR 3/4) moist; massive; slightly hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; 10 percent pebbles; slightly calcareous; carbonates are disseminated; neutral (pH 6.8); abrupt smooth boundary.
R—22 inches; sandstone.

Bedrock is at a depth of 20 to 60 inches. The mollic epipedon is 7 to 15 inches thick. The particle size control section is 0 to 25 percent rock fragments.

The A horizon is sandy loam, gravelly sandy loam, loam, bouldery sandy loam, or stony sandy loam. It has hue of 5YR to 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 to 4. It is neutral to moderately alkaline.

The B horizon is sandy loam, loam, fine sandy loam, channery sandy loam, or gravelly loam. It has hue of 5YR to 5Y, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 2 to 4. It is neutral to moderately alkaline.

The C horizon is loam, sandy loam, fine sandy loam, gravelly sandy loam, or channery sandy loam. It has hue of 5YR to 5Y, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 1 to 6. It is neutral to strongly alkaline.

Thedalund Family

The Thedalund family consists of moderately deep, well drained, moderately slowly permeable soils on side slopes of shale pediments, ridges, and escarpments. These soils formed in colluvium and residuum derived dominantly from shale and sandstone. Slopes are 3 to 70 percent. Elevation is 4,000 to 7,000 feet. Average annual precipitation is 6 to 14 inches, and mean annual air temperature is 45 to 56 degrees F.

These soils are fine-loamy, mixed (calcareous), mesic Ustic Torriorthents.

Reference pedon of Thedalund family, stony, about 1 mile east of Sulphur Canyon, about 2,000 feet south and 2,800 feet west of the northeast corner of sec. 19, T. 18 S., R. 24 E.

C1—0 to 1 inch; pale olive (5Y 6/3) very bouldery loam, olive (5Y 5/3) moist; moderate thin platy structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine and fine pores; 2 percent boulders, 5 percent stones, 30 percent channers, and 10 percent gravel on surface; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.
C2—1 to 3 inches; pale olive (5Y 6/3) sandy clay loam, olive (5Y 5/3) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine pores; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.
C3—3 to 7 inches; olive (5Y 5/4) sandy clay loam, olive (5Y 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few fine pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt smooth boundary.
C4—7 to 22 inches; very dark gray (5Y 3/1) silty clay loam, dark olive gray (5Y 3/2) moist; massive; hard, firm, sticky and plastic; few very fine and fine roots; moderately alkaline (pH 8.4); clear smooth boundary.
C5r—22 inches; weathered shale.

Paralithic contact is at a depth of 20 to 40 inches. The particle size control section is 5 to 35 percent rock fragments. From 30 to 75 percent of the surface is covered with boulders, flagstones, channers, and pebbles. The upper part of the profile is very bouldery loam, extremely channery loam, very stony loam, very gravelly loam, very gravelly sandy clay loam, very gravelly silty clay loam, very channery loam, or extremely channery silty clay loam, and the lower part is sandy clay loam, loam, silty clay loam, or clay. The profile is dominantly 18 to 35 percent clay, but some subhorizons, particularly those above the paralithic contact, have a clay content of more than 35 percent. The profile has hue of 7.5YR to 5Y, value of 3 to 7 when dry and 3 to 6 when moist, and chroma of 1 to 4. It is moderately alkaline or strongly alkaline and is noncalcareous to strongly calcareous.

Toddler Family

The Toddler family consists of very deep, well drained, moderately permeable soils on flood plains and along drainageways. These soils formed in alluvium derived from sandstone and shale. Slopes are 0 to 3 percent. Elevation is 4,000 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 56 degrees F.

These soils are fine-loamy, mixed (calcareous), mesic Typic Torrifluvents.

Reference pedon of a Toddler family soil in an area of Toddler-Ravola-Glenton families association, about 1.5 miles east of Crescent Junction, about 2,000 feet east and 1,000 feet north of the southwest corner of sec. 26, T. 21 S., R. 19 E.

A1—0 to 7 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine and fine interstitial pores; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); abrupt wavy boundary.

C1—7 to 12 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; many fine and medium tubular pores; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.4); gradual wavy boundary.

C2—12 to 36 inches; pale brown (10YR 6/3) sandy clay loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots; common fine and medium tubular pores; slightly calcareous; carbonates are disseminated; moderately alkaline (pH 8.2); gradual wavy boundary.

C3—36 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; massive; slightly hard, friable; few fine roots; common fine and medium tubular pores; moderately calcareous; carbonates are disseminated and in many soft filaments; moderately alkaline (pH 8.4).

The A horizon is loam, silt loam, silty clay loam, or fine sandy loam. It has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4. It is moderately alkaline or strongly alkaline and is moderately calcareous or very strongly calcareous.

The C horizon is fine sandy loam, loam, sandy clay loam, silty clay loam, or silt loam. Clay content is 18 to 35 percent. Thin strata of loamy sand, silt, and very gravelly material are present in some pedons. Rock fragment content generally is less than 10 percent. The horizon has hue of 7.5YR to 2.5Y, value of 5 or 6 when dry and 4 to 6 when moist, and chroma of 2 to 4. It is moderately alkaline or strongly alkaline and is slightly calcareous to very strongly calcareous.

Trook Series

The Trook series consists of very deep, well drained, moderately permeable soils on alluvial fan pediments and fan terraces. These soils formed in mixed alluvium derived from sandstone and conglomerate. Slopes are 2 to 6 percent. Elevation is 4,100 to 4,700 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 52 to 56 degrees F.

These soils are coarse-loamy, mixed, mesic Typic Calciorthids.

Typical pedon of a Trook fine sandy loam in an area of Mesa-Trook complex, about 1.5 miles southwest of Crescent Junction, about 1,000 feet east and 2,000 feet north of the southwest corner of sec. 5, T. 22 S., R. 19 E.

A1—0 to 5 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; moderate thin platy structure; soft, very friable, slightly sticky; common fine and medium roots and few coarse roots; many very fine and fine interstitial pores; 5 percent pebbles on surface; moderately calcareous; moderately alkaline (pH 8.2); clear wavy boundary.

B2ca—5 to 12 inches; light brown (7.5YR 6/4) fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure; soft, very friable, slightly sticky; many fine and medium roots; many very fine and fine tubular pores; 5 percent pebbles; very strongly calcareous; carbonates on underside of pebbles; moderately alkaline (pH 8.2); clear wavy boundary.

C1ca—12 to 32 inches; very pale brown (10YR 8/3) fine sandy loam, pale brown (10YR 6/3) moist; moderate fine and medium subangular blocky structure; very hard, friable, slightly sticky; many very fine, fine, and medium roots; many fine and medium tubular pores; many cicada casts; very strongly calcareous; carbonates coatings on cicada casts; moderately alkaline (pH 8.2); clear wavy boundary.

IIC2—32 to 60 inches; white (10YR 8/2) very gravelly sandy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable; common fine and medium roots; many medium interstitial pores; 35 percent pebbles and 15 percent cobbles; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0).

Bedrock is at a depth of 60 inches or more. The particle size control section is 5 to 25 percent rock fragments. Rock fragment content generally increases with increasing depth; it ranges from 10 to 60 percent

below a depth of 40 inches. Secondary carbonates are at a depth of 5 to 15 inches.

The A horizon is fine sandy loam, loam, or very fine sandy loam. It has hue of 7.5YR or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 4. It is mildly alkaline or moderately alkaline and is slightly calcareous or moderately calcareous.

The B horizon, where present, is loam, fine sandy loam, very fine sandy loam, or gravelly loam. It has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 4 to 6.

The C horizon is loam, silt loam, fine sandy loam, gravelly loam, very gravelly loam, or very gravelly sandy loam. It has hue of 7.5YR or 10YR, value of 6 to 8 when dry and 5 to 7 when moist, and chroma of 2 to 8. It is moderately alkaline or strongly alkaline and is strongly calcareous or very strongly calcareous.

Valleycity Series

The Valleycity series consists of very shallow and shallow, well drained, moderately permeable soils on structural benches and hogbacks. These soils formed in residuum and colluvium derived from sandstone and shale. Slopes are 10 to 25 percent. Elevation is 4,300 to 5,000 feet. Average annual precipitation is 5 to 8 inches, and mean annual air temperature is 51 to 55 degrees F.

These soils are loamy-skeletal, mixed, mesic Lithic Haplargids.

Typical pedon of a Valleycity very stony fine sandy loam, 10 to 25 percent slopes, in an area of Valleycity-Neiber-Rock outcrop complex, about 5.5 miles south of Crescent Junction, about 1,500 feet east and 100 feet north of the southwest corner of sec. 22, T. 22 S., R. 19 E.

A1—0 to 3 inches; light brown (7.5YR 6/4) very stony fine sandy loam, brown (7.5YR 5/4) moist; weak medium platy structure parting to weak fine and very fine subangular blocky; soft, very friable; few very fine and fine roots; 10 percent stones, 20 percent cobbles, and 30 percent pebbles on surface and 10 percent stones, 15 percent cobbles, and 15 percent pebbles in horizon; moderately calcareous; moderately alkaline (pH 8.4); clear wavy boundary.

B2t—3 to 8 inches; brown (7.5YR 5/4) extremely stony sandy clay loam, dark brown (7.5YR 4/4) moist; moderate medium and fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular pores; few thin patchy clay films in pores and bridging sand grains; 20 percent stones, 30 percent cobbles, and 20 percent pebbles; moderately calcareous; carbonates on underside of rock fragments; moderately alkaline (pH 8.2); clear wavy boundary.

B3ca—8 to 12 inches; pink (7.5YR 7/4) extremely stony sandy clay loam, light brown (7.5YR 6/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine and fine tubular pores and common medium tubular pores; 30 percent stones, 20 percent cobbles, and 20 percent pebbles; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 8.8); abrupt irregular boundary.

R—12 inches; sandstone.

Bedrock is at a depth of 7 to 20 inches. The solum is 6 to 14 inches thick. The particle size control section is more than 35 percent rock fragments.

The A horizon is very stony very fine sandy loam, very stony loam, stony fine sandy loam, very stony fine sandy loam, fine sandy loam, and very gravelly fine sandy loam. It has hue of 7.5YR or 10YR, value of 4 to 6 when dry and 4 or 5 when moist, and chroma of 4 to 6.

The Bt horizon is very stony sandy loam, extremely stony sandy clay loam, very stony clay loam, or very gravelly clay loam. It has hue of 7.5YR or 10YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 4 to 6.

The C horizon, where present, has hue of 7.5YR or 10YR, value of 6 to 8 when dry and 5 or 6 when moist, and chroma of 2 to 6.

Walknolls Family

The Walknolls family consists of shallow, well drained, moderately permeable and moderately rapidly permeable soils on canyon escarpments. These soils formed in colluvium and residuum derived dominantly from sandstone and shale. Slopes are 50 to 80 percent. Elevation is 4,200 to 6,000 feet. Average annual precipitation is 6 to 8 inches, and mean annual air temperature is 48 to 52 degrees F.

These soils are loamy-skeletal, mixed (calcareous), mesic Lithic Torriorthents.

Reference pedon of Walknolls family, 50 to 80 percent slopes, above the Green River, about 100 feet south and 1,000 feet east of the northwest corner of sec. 14, T. 19 S., R. 16 E.

A1—0 to 6 inches; light yellowish brown (10YR 6/4) extremely bouldery sandy loam, yellowish brown (10YR 5/4) moist; single grain; soft, very friable; few very fine and fine roots; 3 percent boulders and 25 percent stones on surface and 10 percent pebbles in horizon; slightly calcareous; carbonates are disseminated; mildly alkaline (pH 7.8); abrupt smooth boundary.

C1—6 to 15 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; massive; soft, very friable, slightly plastic; few very fine roots; 60 percent pebbles; moderately calcareous; carbonates are disseminated; moderately alkaline (pH 8.0); abrupt smooth boundary.

R—15 inches; hard sandstone.

Bedrock is at a depth of 10 to 20 inches. The particle size control section is 35 to 80 percent rock fragments.

The profile is extremely bouldery sandy loam, very channery loam, very bouldery sandy loam, very gravelly sandy loam, extremely channery sandy loam, or extremely gravelly sandy clay loam. It has hue of 7.5YR to 2.5Y, value of 4 to 6 when dry and 3 to 6 when moist, and chroma of 2 to 4. It is mildly alkaline or moderately alkaline and is noncalcareous or slightly calcareous.

Windwhistle Series

The Windwhistle series consists of moderately deep, well drained, moderately rapidly permeable soils on cuestas. These soils formed in eolian and residual material derived dominantly from sandstone. Slopes are 2 to 10 percent. Elevation is 5,900 to 6,100 feet. Average annual precipitation is 8 to 12 inches, and mean annual air temperature is 49 to 54 degrees F.

These soils are coarse-loamy, mixed, mesic Ustollic Haplargids.

Typical pedon of a Windwhistle fine sandy loam in an area of Windwhistle-Begay complex, about 26 miles south of Crescent Junction, about 1,900 feet east and 1,600 feet north of the southwest corner of sec. 19, T. 26 S., R. 20 E.

A1—0 to 4 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium and fine platy structure; soft, very friable; common fine and very fine roots and few coarse roots; many fine and very fine interstitial pores; slightly calcareous; moderately alkaline (pH 8.0); clear wavy boundary.

B21t—4 to 17 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; hard, friable; many fine and very fine roots and common medium and coarse roots; many fine and very fine tubular pores and common medium and coarse tubular pores; moderately alkaline (pH 8.4); gradual wavy boundary.

B22t—17 to 24 inches; yellowish red (5YR 5/6) fine sandy loam, yellowish red (5YR 4/6) moist; strong medium subangular blocky structure; very hard, friable; common medium and few coarse roots; common medium, fine, and very fine tubular pores; strongly calcareous; carbonates coating some cicada krotovina; strongly alkaline (pH 8.6); gradual wavy boundary.

C1ca—24 to 30 inches; reddish yellow (5YR 7/6) fine sandy loam, reddish brown (5YR 5/4) moist; strong medium subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common medium and fine roots and few coarse roots; common fine and very fine tubular pores; horizon is worked by cicada; very strongly calcareous; carbonates coating cicada krotovina and disseminated; strongly alkaline (pH 9.0); gradual wavy boundary.

C2ca—30 to 36 inches; reddish yellow (5YR 7/6) fine sandy loam, reddish brown (5YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common medium and fine roots and few coarse roots; common medium, fine, and very fine tubular pores; 5 percent sandstone fragments; very strongly calcareous; carbonates are disseminated; strongly alkaline (pH 9.0); clear wavy boundary.

R—36 inches; sandstone.

Bedrock is at a depth of 20 to 40 inches. Clay content in the particle size control section is less than 18 percent. The profile has hue of 5YR or 7.5YR.

The A horizon is fine sandy loam, very fine sandy loam, or loamy fine sand.

The B horizon is fine sandy loam or sandy loam. It is moderately alkaline or strongly alkaline.

The C horizon is fine sandy loam or sandy loam.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial cone. The material washed down the sides of mountains and hills by ephemeral streams and deposited at the mouth of gorges in the form of a moderately steep, conical mass descending equally in all directions from the point of issue.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses.

Arroyo. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Bajada. A broad alluvial slope extending from the base of a mountain range out into a basin and formed by coalescence of separate alluvial fans.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breaks. The steep to very steep broken land at the border of an upland summit that is dissected by ravines.

Breast height. An average height of 4 1/2 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition of woody vegetation to allow understory grasses and forbs to recover, or to make conditions favorable for reseeding. It increases production of forage, which reduces erosion. Brush management may improve the habitat for some species of wildlife.

Butte. An isolated small mountain or hill with steep or precipitous sides and a top variously flat, rounded, or pointed that may be a residual mass isolated by erosion or an exposed volcanic neck.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Cadastral survey. A survey locating subdivision boundaries in the west by section, township, and range.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Canyon. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage. **Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Cirque. Semicircular, concave, bowllike areas that have steep faces primarily resulting from glacial ice and snow abrasion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map

them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conglomerate. A coarse grained, clastic rock composed of rounded to subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. If soil improving crops and practices used in the system more than offset the soil depleting crops and deteriorating practices, then it is a good conservation cropping system. Cropping systems are needed on all tilled soils. Soil improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft rock.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coppice dune. A small dune of fine-grained soil material stabilized around shrubs or small trees.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops using a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that village is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cuesta. An asymmetric, homoclinal ridge capped by resistant rock layers of slight to moderate dip.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Delta. A body of alluvium whose surface is nearly flat and fan shaped, deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Desert pavement. A layer of gravel or coarser fragments on a desert soil surface that was emplaced by upward movement of fragments from underlying sediment or remains after finer particles have been removed by running water or wind.

Dip slope. A slope of the land surface, roughly determined by and approximately conforming with the dip of underlying bedded rock.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce water erosion. One strip is in a close-growing crop

that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Draw. A small stream valley, generally more open and with broader bottom land than a ravine or gulch.

Duff. A term used to identify a generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature; for example, fire that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting. Synonym: scarp.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, and clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of men and equipment in fire fighting. Designated roads also serve as firebreaks.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (or 300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard rock. Rock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

High-residue crops. Crops such as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors of predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Knoll. A small, low, rounded hill rising above adjacent landforms.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Observed rooting depth. Depth to which roots have been observed to penetrate.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to premit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10

square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Post and piling outlet. A market location where posts and pilings are bought, processed, and sold.

Potential plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed. (See climax plant community.)

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. The application of fire to land under such conditions of weather, soil moisture, and time of day as presumably will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This increases the vigor and reproduction of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4

Strongly alkaline ..... 8.5 to 9.0
Very strongly alkaline ..... 9.1 and higher

Red beds. Sedimentary strata mainly red in color and composed largely of sandstone and shale.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site class. A grouping of site indexes into 5 to 7 production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant trees for the range of ages on soils that differ in productivity. such level is represented by a curve. The basis of the curves is the height of dominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that show the average height of dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms,

and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

	Percent
Nearly level	0 to 2
Gently sloping	2 to 15
Moderately steep	15 to 30
Steep	30 to 50
Very steep	50 and higher

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^+ to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soft rock. Rock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Tail water. The water just downstream of a structure.

Talus. Rock fragments of any size or shape, commonly coarse and angular, derived from and lying at the base of a cliff or very steep, rock slope. The accumulated mass of such loose, broken rock formed chiefly by falling, rolling, or sliding.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water supplying capacity. The capacity of a soil to supply water to plants that is stored during periods of plant dormancy plus the precipitation stored during the growing season until the moisture is depleted.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The action of uprooting and tipping over trees by the wind.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-80 at Thompson, UT]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	37.7	15.8	26.8	57	-7	51	0.84	0.12	1.38	2	5.1
February---	46.1	22.4	34.3	65	4	101	0.52	0.02	0.89	2	1.9
March------	55.2	29.0	42.1	74	12	151	0.75	0.06	1.26	3	1.4
April------	65.8	37.8	51.8	81	21	358	0.67	0.26	1.02	3	0.1
May--------	75.8	47.6	61.7	90	31	673	0.88	0.18	1.43	3	0.0
June-------	86.7	57.1	71.9	99	40	957	0.47	---	0.81	2	0.0
July-------	93.1	64.7	78.9	100	53	1,206	0.59	0.06	0.97	2	0.0
August-----	90.1	62.1	76.1	100	49	1,119	1.08	0.26	1.73	3	0.0
September--	81.8	53.1	67.5	96	37	825	0.79	0.11	1.32	2	0.0
October----	70.6	42.2	56.4	85	24	508	0.96	0.10	1.62	2	0.0
November---	53.0	29.1	41.1	72	11	121	0.63	0.21	0.98	2	0.7
December---	40.9	18.6	29.8	58	0	45	0.53	0.16	0.84	2	2.9
Yearly:											
Average--	66.4	40.0	53.2	---	---	---	---	---	---	---	---
Extreme--	---	---	---	101	-8	---	---	---	---	---	---
Total----	---	---	---	---	---	6,115	8.71	6.20	11.03	28	12.1

*A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for range vegetation in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-80 at Thompson, UT]

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 20	April 30	May 11
2 years in 10 later than--	April 16	April 25	May 6
5 years in 10 later than--	April 8	April 15	April 28
First freezing temperature in fall:			
1 year in 10 earlier than--	October 24	October 17	October 5
2 years in 10 earlier than--	October 30	October 22	October 11
5 years in 10 earlier than--	November 8	November 1	October 23

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-80 at Thompson, UT]

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	194	178	159
8 years in 10	201	185	165
5 years in 10	215	199	177
2 years in 10	229	213	190
1 year in 10	236	220	196

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Abra-Barx complex	2,940	0.2
2	Barx fine sandy loam	22,710	1.4
3	Begay Variant fine sandy loam, 3 to 15 percent slopes	808	0.1
4	Begay-Sazi complex	38,910	2.5
5	Begay-Sazi-Rizno complex	14,996	1.0
6	Begay-Rizno complex	20,151	1.3
7	Blueflat complex	16,836	1.1
8	Blueflat-Neiber complex	13,345	0.9
9	Bookcliff-Shalako complex	6,878	0.5
10	Chipeta silty clay loam, 10 to 25 percent slopes	17,656	1.1
11	Chipeta complex	98,548	6.2
12	Chipeta-Badland complex	29,286	1.9
13	Dast family, 50 to 80 percent slopes	84,693	5.3
14	Dune land-Aneth family complex	2,035	0.1
15	Factory-Pastern fine sandy loams	1,400	0.1
16	Firth-Plite families association	990	0.1
17	Flatnose sandy loam, 1 to 8 percent slopes	9,609	0.6
18	Hanksville family-Badland complex	60,820	3.8
19	Hanksville family-Shalet complex	2,435	0.2
20	Hostage-Barx complex	10,151	0.7
21	Hostage-Chipeta complex	15,065	1.0
22	Hub family, 50 to 80 percent slopes	3,775	0.2
23	Killpack silt loam, 1 to 10 percent slopes	11,915	0.7
24	Killpack-Chipeta complex	28,686	1.8
25	Killpack-Blueflat complex	16,401	1.0
26	Leeko fine sandy loam	3,056	0.2
27	Lockerby-Shalako complex	14,804	0.9
28	Mack loam, 2 to 6 percent slopes	14,704	0.9
29	Mack-Sagers complex	9,030	0.6
30	Mesa fine sandy loam, 2 to 6 percent slopes	9,176	0.6
31	Mesa-Chipeta-Thedalund family complex	29,893	1.8
32	Mesa-Trook complex	13,774	0.9
33	Mido loamy fine sand, 2 to 20 percent slopes	2,492	0.2
34	Mido-Sazi complex	13,312	0.8
35	Moenkopie-Rock outcrop complex	48,040	3.0
36	Moenkopie-Shalako-Sandoval complex	5,301	0.3
37	Moepitz Variant very stony sandy loam, 2 to 10 percent slopes	1,970	0.1
38	Muff family-Badland complex	16,782	1.1
39	Myton family-Rock outcrop complex	45,403	2.8
40	Nakai fine sandy loam, 3 to 10 percent slopes	22,561	1.4
41	Nakai-Moenkopie complex	6,662	0.4
42	Nakai-Redlands complex	9,704	0.6
43	Nakai-Sheppard complex	7,957	0.5
44	Pennell sandy loam, 3 to 15 percent slopes	2,253	0.1
45	Razorba family, 50 to 80 percent slopes	12,019	0.8
46	Redbank family	6,498	0.4
47	Redbank-Flatnose families association	8,082	0.5
48	Redbank-Flatnose, cool families association	2,579	0.2
49	Reva-Falcon families-Rock outcrop complex	103,650	6.3
50	Riverwash	587	*
51	Rizno-Begay complex	12,900	0.8
52	Rizno-Rock outcrop complex	85,314	5.3
53	Rock outcrop	44,056	2.8
54	Rock outcrop-Arches-Mido complex	59,949	3.8
55	Rock outcrop-Moenkopie association	26,776	1.7
56	Sagers silt loam	9,245	0.6
57	Sandoval-Strych complex	3,764	0.2
58	Sandoval-Killpack complex	17,552	1.1
59	Sandoval-Thedalund family complex	1,026	0.1
60	Sazi fine sandy loam, 3 to 8 percent slopes	2,051	0.1
61	Sazi-Shalako-Mido complex	6,440	0.4
62	Shalako gravelly sandy loam, 3 to 8 percent slopes	16,295	1.0
63	Shalako sandy loam, 3 to 30 percent slopes	49,975	3.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
64	Shalet loam, 3 to 10 percent slopes	3,241	0.2
65	Shalet-Nakai complex	4,957	0.3
66	Sheppard fine sand, 2 to 10 percent slopes	1,842	0.1
67	Skylick sandy loam, 8 to 30 percent slopes	6,634	0.4
68	Slickens	156	*
69	Strych fine sandy loam, 1 to 8 percent slopes	6,161	0.4
70	Sula-Razorba families complex	58,216	3.6
71	Thedalund family, cool	1,374	0.1
72	Thedalund family, moist	64,474	4.0
73	Thedalund family, stony	38,914	2.4
74	Thedalund family-Rock outcrop-Badland association	20,862	1.3
75	Toddler-Ravola-Glenton families association	82,888	5.2
76	Valleycity-Neiber-Rock outcrop complex	11,732	0.7
77	Walknolls family, 50 to 80 percent slopes	11,826	0.7
78	Windwhistle-Begay complex	3,971	0.2
	Water	2,790	0.2
	Total	1,596,709	100.0

* Less than 0.1 percent.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support vegetation suitable for grazing are listed. Two asterisks in the "Grazing site" column identify a woodland site that supports grazeable understory]

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
1*:					
Abra	Semidesert Loam (Wyoming Big Sagebrush).	Favorable	900	Wyoming big sagebrush	20
		Normal	700	Indian ricegrass	20
		Unfavorable	500	Needleandthread	10
				Bottlebrush squirreltail	10
				Galleta	10
				Winterfat	5
				Globemallow	5
Barx	Semidesert Loam (Wyoming Big Sagebrush).	Favorable	900	Indian ricegrass	20
		Normal	700	Wyoming big sagebrush	20
		Unfavorable	500	Galleta	10
				Bottlebrush squirreltail	10
				Needleandthread	10
				Globemallow	5
				Winterfat	5
2	Semidesert Loam (Wyoming Big Sagebrush).	Favorable	900	Indian ricegrass	20
Barx		Normal	700	Wyoming big sagebrush	20
		Unfavorable	500	Galleta	10
				Bottlebrush squirreltail	10
				Needleandthread	10
				Globemallow	5
				Winterfat	5
3	Upland Loam (Basin Big Sagebrush).	Favorable	1,300	Western wheatgrass	15
Begay Variant		Normal	1,100	Big sagebrush	15
		Unfavorable	800	Indian ricegrass	10
				Muttongrass	10
				Needleandthread	10
				Fourwing saltbush	5
4*:					
Begay	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Galleta	10
				Fourwing saltbush	10
				Mormon-tea	10
				Sand dropseed	10
				Winterfat	5
Sazi	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Galleta	10
				Sand dropseed	10
				Fourwing saltbush	10
				Mormon-tea	10
				Winterfat	5
5*:					
Begay	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Galleta	10
				Fourwing saltbush	10
				Mormon-tea	10
				Sand dropseed	10
				Winterfat	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
5*:					
Sazi	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Galleta	10
				Sand dropseed	10
				Fourwing saltbush	10
				Mormon-tea	10
				Winterfat	5
Rizno	Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon)**.	Favorable	400	Blackbrush	35
		Normal	350	Mormon-tea	10
		Unfavorable	250	Galleta	5
				Indian ricegrass	5
6*:					
Begay	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Galleta	10
				Fourwing saltbush	10
				Mormon-tea	10
				Sand dropseed	10
				Winterfat	5
Rizno	Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon)**.	Favorable	400	Blackbrush	35
		Normal	350	Mormon-tea	10
		Unfavorable	250	Galleta	5
				Indian ricegrass	5
7*:					
Blueflat	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Bud sagebrush	5
				Deserttrumpet	5
Blueflat, saline	Desert Shallow Clay	Favorable	300	Mat saltbush	60
		Normal	200	Galleta	10
		Unfavorable	100	Deserttrumpet	5
				Bud sagebrush	5
8*:					
Blueflat	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Bud sagebrush	5
				Deserttrumpet	5
Neiber	Desert Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Shadscale	20
		Unfavorable	300	Galleta	10
				Bud sagebrush	5
				Winterfat	5
				Globemallow	5
9*:					
Bookcliff	Mountain Loam (Oak)	Favorable	1,750	Gambel oak	30
		Normal	1,200	Bluegrass	10
		Unfavorable	650	Snowberry	10
				Wheatgrass	5
				Mountain big sagebrush	5
				Serviceberry	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
9*:					
Shalako	Upland Shallow Loam (Pinyon-Utah Juniper)**.	Favorable	500	Mexican cliffrose	15
		Normal	400	Birchleaf mountainmahongany	15
		Unfavorable	300	Indian ricegrass	10
				Mormon-tea	10
				Salina wildrye	10
				Black sagebrush	5
10 Chipeta	Desert Shallow Clay	Favorable	300	Mat saltbush	60
		Normal	200	Galleta	10
		Unfavorable	100	Deserttrumpet	5
				Bud sagebrush	5
11*:					
Chipeta	Desert Shallow Clay	Favorable	300	Mat saltbush	60
		Normal	200	Galleta	10
		Unfavorable	100	Deserttrumpet	5
				Bud sagebrush	5
Chipeta, thick	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Deserttrumpet	5
				Bottlebrush squirreltail	5
				Bud sagebrush	5
12*:					
Chipeta	Desert Shallow Clay	Favorable	300	Mat saltbush	60
		Normal	200	Galleta	10
		Unfavorable	100	Deserttrumpet	5
				Bud sagebrush	5
Badland.					
13* Dast family	Upland Very Steep Loam (Pinyon-Utah Juniper)**.	Favorable	360	Wyoming big sagebrush	15
		Normal	300	Salina wildrye	10
		Unfavorable	225	Needleandthread	10
				Indian ricegrass	10
				Birchleaf mountainmahogany	10
14*:					
Dune land.					
Aneth family	Desert Sand	Favorable	800	Indian ricegrass	30
		Normal	500	Fourwing saltbush	15
		Unfavorable	300	Galleta	10
				Needleandthread	10
				Spike dropseed	5
				Sand dropseed	5
				Mormon-tea	5
				Winterfat	5
15*:					
Factory	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Galleta	10
				Sand dropseed	10
				Fourwing saltbush	10
				Mormon-tea	10
				Winterfat	5
Pastern	Semidesert Shallow Sandy Loam (Blackbrush).	Favorable	500	Blackbrush	65
		Normal	350	Indian ricegrass	5
		Unfavorable	200	Galleta	5
				Torrey Mormon-tea	5
				Bigelow sagebrush	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
16*:					
Firth family------	Semiwet Fresh Streambank------	Favorable	2,500	Waterbirch----------	20
		Normal	2,000	Willow----------	15
		Unfavorable	1,500	Mountain brome----------	5
				Basin wildrye----------	5
				Kentucky bluegrass----------	5
				Serviceberry----------	5
				Basin big sagebrush----------	5
				Wood rose----------	5
Plite family------	Mountain Loam (Oak)----------	Favorable	1,750	Gambel oak----------	30
		Normal	1,200	Bluegrass----------	10
		Unfavorable	650	Snowberry----------	10
				Wheatgrass----------	5
				Serviceberry----------	5
				Mountain big sagebrush--------	5
17---------- Flatnose	Loamy Bottom----------	Favorable	2,000	Basin wildrye----------	25
		Normal	1,500	Basin big sagebrush----------	15
		Unfavorable	1,000	Needleandthread----------	10
				Muttongrass----------	10
				Western wheatgrass----------	10
				Indian ricegrass----------	5
				Rubber rabbitbrush----------	5
18*:					
Hanksville family-	Desert Clay----------	Favorable	375	Wedgeleaf saltbush----------	35
		Normal	275	Galleta----------	15
		Unfavorable	175	Indian ricegrass----------	10
				Bottlebrush squirreltail------	5
				Deserttrumpet----------	5
				Bud sagebrush----------	5
				Winterfat----------	5
Badland.					
19*:					
Hanksville family-	Desert Clay----------	Favorable	375	Wedgeleaf saltbush----------	35
		Normal	275	Galleta----------	15
		Unfavorable	175	Indian ricegrass----------	10
				Bottlebrush squirreltail------	5
				Deserttrumpet----------	5
				Bud sagebrush----------	5
				Winterfat----------	5
Shalet----------	Desert Shallow Loam (Shadscale).	Favorable	500	Shadscale----------	30
		Normal	300	Galleta----------	15
		Unfavorable	200	Bud sagebrush----------	10
				Indian ricegrass----------	5
				Mormon-tea----------	5
				Wedgeleaf saltbush----------	5
20*:					
Hostage----------	Desert Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	500	Shadscale----------	20
		Unfavorable	300	Galleta----------	10
				Bud sagebrush----------	5
				Winterfat----------	5
				Globemallow----------	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight Lb/acre		Pct
20*:					
Barx	Semidesert Loam (Wyoming Big Sagebrush).	Favorable	900	Indian ricegrass	20
		Normal	700	Wyoming big sagebrush	20
		Unfavorable	500	Galleta	10
				Bottlebrush squirreltail	10
				Needleandthread	10
				Globemallow	5
				Winterfat	5
21*:					
Hostage	Desert Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Shadscale	20
		Unfavorable	300	Galleta	10
				Bud sagebrush	5
				Winterfat	5
				Globemallow	5
Chipeta	Desert Shallow Clay	Favorable	300	Mat saltbush	60
		Normal	200	Galleta	10
		Unfavorable	100	Deserttrumpet	5
				Bud sagebrush	5
22* Hub family	High Mountain Very Steep Loam (Douglas-fir)**.	Favorable	100	Snowberry	10
		Normal	75	Oregon-grape	10
		Unfavorable	50	Mountainlover	10
				Needlegrass	5
				Wheatgrass	5
				Sedge	5
				Bluegrass	5
23 Killpack	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Bud sagebrush	5
				Deserttrumpet	5
24*:					
Killpack	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Bud sagebrush	5
				Deserttrumpet	5
Chipeta	Desert Shallow Clay	Favorable	300	Mat saltbush	60
		Normal	200	Galleta	10
		Unfavorable	100	Deserttrumpet	5
				Bud sagebrush	5
25*:					
Killpack	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Bud sagebrush	5
				Deserttrumpet	5
Blueflat	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Bud sagebrush	5
				Deserttrumpet	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
26---------- Leeko	Alkali Fan----------	Favorable	500	Galleta----------	20
		Normal	300	Wedgeleaf saltbush----------	20
		Unfavorable	200	Indian ricegrass----------	15
				Globemallow----------	5
				Bud sagebrush----------	5
				Winterfat----------	5
27*:					
Lockerby----------	Semidesert Stony Loam (Salina Wildrye).	Favorable	400	Shadscale----------	25
		Normal	300	Bud sagebrush----------	15
		Unfavorable	200	Bottlebrush squirreltail------	15
				Winterfat----------	10
				Salina wildrye----------	10
				Indian ricegrass----------	5
Shalako----------	Upland Shallow Loam (Pinyon-Utah Juniper)**.	Favorable	500	Mexican cliffrose----------	15
		Normal	400	Birchleaf mountainmahogany----	15
		Unfavorable	300	Indian ricegrass----------	10
				Mormon-tea----------	10
				Salina wildrye----------	10
				Black sagebrush----------	5
28---------- Mack	Desert Loam----------	Favorable	700	Shadscale----------	20
		Normal	500	Indian ricegrass----------	20
		Unfavorable	300	Galleta----------	10
				Globemallow----------	5
				Bud sagebrush----------	5
				Winterfat----------	5
29*:					
Mack----------	Desert Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	500	Shadscale----------	20
		Unfavorable	300	Galleta----------	10
				Globemallow----------	5
				Bud sagebrush----------	5
				Winterfat----------	5
Mack, overwash----	Desert Shallow Loam (Shadscale).	Favorable	500	Shadscale----------	30
		Normal	300	Galleta----------	15
		Unfavorable	200	Bud sagebrush----------	10
				Indian ricegrass----------	5
				Mormon-tea----------	5
				Wedgeleaf saltbush----------	5
Sagers----------	Desert Clay----------	Favorable	375	Wedgeleaf saltbush----------	35
		Normal	275	Galleta----------	15
		Unfavorable	175	Indian ricegrass----------	10
				Bottlebrush squirreltail------	5
				Winterfat----------	5
				Deserttrumpet----------	5
30---------- Mesa	Desert Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	500	Shadscale----------	20
		Unfavorable	300	Galleta----------	10
				Bud sagebrush----------	5
				Winterfat----------	5
				Globemallow----------	5
31*:					
Mesa----------	Desert Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	500	Shadscale----------	20
		Unfavorable	300	Galleta----------	10
				Bud sagebrush----------	5
				Winterfat----------	5
				Globemallow----------	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
31*:					
Chipeta	Desert Shallow Clay	Favorable	300	Mat saltbush	60
		Normal	200	Galleta	10
		Unfavorable	100	Deserttrumpet	5
				Bud sagebrush	5
Thedalund family	Semidesert Shallow Loam (Salina Wildrye).	Favorable	400	Shadscale	30
		Normal	250	Galleta	15
		Unfavorable	150	Wedgeleaf saltbush	15
				Salina wildrye	5
				Bud sagebrush	5
32*:					
Mesa	Desert Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Shadscale	20
		Unfavorable	300	Galleta	10
				Bud sagebrush	5
				Winterfat	5
				Globemallow	5
Trook	Desert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	550	Galleta	10
		Unfavorable	350	Fourwing saltbush	10
				Shadscale	10
				Globemallow	10
				Winterfat	5
				Sand dropseed	5
				Torrey Mormon-tea	5
				Locoweed	5
33 Mido	Semidesert Sand	Favorable	800	Indian ricegrass	20
		Normal	600	Needleandthread	10
		Unfavorable	300	Fourwing saltbush	10
				Mormon-tea	5
				Galleta	5
				Dropseed	5
				Munro globemallow	5
				Sand sagebrush	5
				Finebranched eriogonum	5
				Sandhill muhly	5
34*:					
Mido	Semidesert Sand	Favorable	800	Indian ricegrass	20
		Normal	600	Fourwing saltbush	10
		Unfavorable	300	Needleandthread	10
				Dropseed	5
				Sandhill muhly	5
				Mormon-tea	5
				Galleta	5
				Munro globemallow	5
				Sand sagebrush	5
				Finebranch eriogonum	5
Sazi	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Fourwing saltbush	10
				Sand dropseed	10
				Galleta	10
				Mormon-tea	10
				Winterfat	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
35*:					
Moenkopie	Desert Shallow Sandy Loam	Favorable	350	Galleta	20
		Normal	250	Indian ricegrass	15
		Unfavorable	100	Shadscale	15
				Sand dropseed	5
				Blackbrush	5
				Mormon-tea	5
				Winterfat	5
Rock outcrop.					
36*:					
Moenkopie	Desert Shallow Sandy Loam	Favorable	350	Galleta	20
		Normal	250	Indian ricegrass	15
		Unfavorable	100	Shadscale	15
				Sand dropseed	5
				Blackbrush	5
				Mormon-tea	5
				Winterfat	5
Shalako	Semidesert Shallow Loam (Utah Juniper-Pinyon)**.	Favorable	350	Saline wildrye	20
		Normal	250	Black sagebrush	20
		Unfavorable	150	Bluebunch wheatgrass	10
				Mormon-tea	10
				Galleta	5
Sandoval	Semidesert Shallow Loam (Salina Wildrye).	Favorable	400	Shadscale	30
		Normal	250	Galleta	15
		Unfavorable	150	Wedgeleaf saltbush	15
				Salina wildrye	5
				Bud sagebrush	5
37 Moepitz Variant	Desert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	550	Galleta	10
		Unfavorable	350	Globemallow	10
				Fourwing saltbush	10
				Shadscale	10
				Winterfat	5
				Sand dropseed	5
				Torrey Mormon-tea	5
				Locoweed	5
38*:					
Muff family	Alkali Fan	Favorable	500	Galleta	20
		Normal	300	Wedgeleaf saltbush	20
		Unfavorable	200	Indian ricegrass	15
				Globemallow	5
				Bud sagebrush	5
				Winterfat	5
Badland.					
39*:					
Myton family	Talus Slope	Favorable	300	Shadscale	15
		Normal	225	Blackbrush	15
		Unfavorable	100	Salina wildrye	10
				Galleta	10
				Indian ricegrass	5
				Mormon-tea	5
Rock outcrop.					

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
40---------- Nakai	Desert Sandy Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	550	Galleta----------	10
		Unfavorable	350	Fourwing saltbush----------	10
				Globemallow----------	10
				Shadscale----------	10
				Winterfat----------	5
				Torrey Mormon-tea----------	5
				Sand dropseed----------	5
				Locoweed----------	5
41*:					
Nakai----------	Desert Sandy Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	550	Galleta----------	10
		Unfavorable	350	Fourwing saltbush----------	10
				Globemallow----------	10
				Shadscale----------	10
				Winterfat----------	5
				Torrey Mormon-tea----------	5
				Sand dropseed----------	5
				Locoweed----------	5
Moenkopie---------	Desert Shallow Sandy Loam-----	Favorable	350	Galleta----------	20
		Normal	250	Indian ricegrass----------	15
		Unfavorable	100	Shadscale----------	15
				Sand dropseed----------	5
				Blackbrush----------	5
				Mormon-tea----------	5
				Winterfat----------	5
42*:					
Nakai----------	Desert Sandy Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	550	Galleta----------	10
		Unfavorable	350	Fourwing saltbush----------	10
				Globemallow----------	10
				Shadscale----------	10
				Winterfat----------	5
				Torrey Mormon-tea----------	5
				Sand dropseed----------	5
				Locoweed----------	5
Redlands----------	Desert Sandy Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	550	Galleta----------	10
		Unfavorable	350	Fourwing saltbush----------	10
				Globemallow----------	10
				Shadscale----------	10
				Winterfat----------	5
				Sand dropseed----------	5
				Torrey Mormon-tea----------	5
				Locoweed----------	5
43*:					
Nakai----------	Desert Sandy Loam----------	Favorable	700	Indian ricegrass----------	20
		Normal	550	Galleta----------	10
		Unfavorable	350	Fourwing saltbush----------	10
				Globemallow----------	10
				Shadscale----------	10
				Sand dropseed----------	5
				Winterfat----------	5
				Torrey Mormon-tea----------	5
				Locoweed----------	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
43*:					
Sheppard	Desert Sand	Favorable	800	Indian ricegrass	30
		Normal	500	Fourwing saltbush	15
		Unfavorable	300	Galleta	10
				Needleandthread	10
				Mormon-tea	5
				Sand dropseed	5
				Winterfat	5
				Spike dropseed	5
44	Desert Shallow Sandy Loam	Favorable	350	Blackbrush	55
Pennell	(Blackbrush).	Normal	200	Galleta	10
		Unfavorable	100	Mormon-tea	5
				Indian ricegrass	5
				Shadscale	5
				Broom snakeweed	5
45*	Mountain Very Steep Loam (Oak)	Favorable	1,400	Gambel oak	30
Razorba family		Normal	1,000	Bluegrass	10
		Unfavorable	600	Snowberry	10
				Serviceberry	5
				Wheatgrass	5
				Mountain big sagebrush	5
46*	Alkali Flat	Favorable	1,000	Black greasewood	30
Redbank family		Normal	700	Shadscale	10
		Unfavorable	500	Bottlebrush squirreltail	10
				Alkali sacaton	10
				Galleta	5
				Indian ricegrass	5
				Seepweed	5
47*:					
Redbank family	Alkali Flat	Favorable	1,000	Black greasewood	30
		Normal	700	Shadscale	10
		Unfavorable	500	Bottlebrush squirreltail	10
				Alkali sacaton	10
				Galleta	5
				Indian ricegrass	5
				Seepweed	5
Flatnose family	Salt Riparian Stream Bank	Favorable	2,000	Inland saltgrass	25
		Normal	1,500	Alkali sacaton	20
		Unfavorable	1,000	Skunkbush sumac	15
				Coyote willow	10
				Fremont cottonwood	10
				Scratch grass	5
48*:					
Redbank family	Alkali Flat	Favorable	1,000	Black greasewood	30
		Normal	700	Shadscale	10
		Unfavorable	500	Bottlebrush squirreltail	10
				Alkali sacaton	10
				Galleta	5
				Indian ricegrass	5
				Seepweed	5
Flatnose family	Loamy Bottom	Favorable	2,000	Basin wildrye	25
		Normal	1,500	Basin big sagebrush	15
		Unfavorable	1,000	Needleandthread	10
				Muttongrass	10
				Western wheatgrass	10
				Indian ricegrass	5
				Rubber rabbitbrush	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
49*:					
Reva family-------	Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)**.	Favorable	700	Salina wildrye----------	20
		Normal	500	Indian ricegrass----------	10
		Unfavorable	300	Birchleaf mountainmahogany----	10
				Utah serviceberry----------	10
				Bluegrass----------	5
				Needleandthread----------	5
				Bluebunch wheatgrass----------	5
				Antelope bitterbrush----------	5
				Mormon-tea----------	5
Falcon family-----	Upland Very Steep Shallow Loam (Pinyon-Utah Juniper)**.	Favorable	700	Salina wildrye----------	20
		Normal	500	Indian ricegrass----------	10
		Unfavorable	300	Birchleaf mountainmahogany----	10
				Utah serviceberry----------	10
				Bluegrass----------	5
				Needleandthread----------	5
				Bluebunch wheatgrass----------	5
				Antelope bitterbrush----------	5
				Mormon-tea----------	5
Rock outcrop.					
51*:					
Rizno----------	Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon)**.	Favorable	400	Blackbrush----------	35
		Normal	350	Mormon-tea----------	10
		Unfavorable	250	Galleta----------	5
				Indian ricegrass----------	5
Begay----------	Semidesert Sandy Loam---------	Favorable	700	Indian ricegrass----------	20
		Normal	500	Needleandthread----------	15
		Unfavorable	300	Galleta----------	10
				Fourwing saltbush----------	10
				Sand dropseed----------	10
				Mormon-tea----------	10
				Winterfat----------	5
52*:					
Rizno----------	Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon)**.	Favorable	400	Blackbrush----------	35
		Normal	350	Mormon-tea----------	10
		Unfavorable	250	Galleta----------	5
				Indian ricegrass----------	5
Rock outcrop.					
54*:					
Rock outcrop.					
Arches----------	Semidesert Shallow Sandy Loam (Utah Juniper-Pinyon)**.	Favorable	400	Blackbrush----------	35
		Normal	350	Mormon-tea----------	10
		Unfavorable	250	Indian ricegrass----------	5
				Galleta----------	5
Mido----------	Semidesert Sand----------	Favorable	800	Indian ricegrass----------	20
		Normal	600	Needleandthread----------	10
		Unfavorable	300	Fourwing saltbush----------	10
				Dropseed----------	5
				Sandhill muhly----------	5
				Galleta----------	5
				Mormon-tea----------	5
				Munroe globemallow----------	5
				Sand sagebrush----------	5
				Finebranched eriogonum--------	5
55*:					
Rock outcrop.					

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
55*:					
Moenkopie	Desert Shallow Sandy Loam	Favorable	350	Galleta	20
		Normal	250	Indian ricegrass	15
		Unfavorable	100	Shadscale	15
				Sand dropseed	5
				Blackbrush	5
				Mormon-tea	5
				Winterfat	5
56	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
Sagers		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Winterfat	5
				Deserttrumpet	5
57*:					
Sandoval	Semidesert Shallow Loam (Salina Wildrye).	Favorable	400	Shadscale	30
		Normal	250	Galleta	15
		Unfavorable	150	Wedgeleaf saltbush	15
				Salina wildrye	5
				Bud sagebrush	5
Strych	Semidesert Stony Loam (Utah Juniper-Pinyon)**.	Favorable	650	Needleandthread	10
		Normal	500	Galleta	10
		Unfavorable	350	Birchleaf mountainmahogany	10
				Black sagebrush	10
				Mormon-tea	10
				Salina wildrye	5
				Bluebunch wheatgrass	5
				Indian ricegrass	5
				Bottlebrush squirreltail	5
58*:					
Sandoval	Semidesert Shallow Loam (Salina Wildrye).	Favorable	400	Shadscale	30
		Normal	250	Galleta	15
		Unfavorable	150	Wedgeleaf saltbush	15
				Bud sagebrush	5
				Salina wildrye	5
Killpack	Desert Clay	Favorable	375	Wedgeleaf saltbush	35
		Normal	275	Galleta	15
		Unfavorable	175	Indian ricegrass	10
				Bottlebrush squirreltail	5
				Winterfat	5
				Bud sagebrush	5
				Deserttrumpet	5
59*:					
Sandoval	Semidesert Shallow Loam (Salina Wildrye).	Favorable	400	Shadscale	30
		Normal	250	Galleta	15
		Unfavorable	150	Wedgeleaf saltbush	15
				Salina wildrye	5
				Bud sagebrush	5
Thedalund family	Semidesert Gravelly Loam (Wyoming Big Sagebrush).	Favorable	600	Wyoming big sagebrush	30
		Normal	400	Galleta	15
		Unfavorable	300	Indian ricegrass	10
				Needleandthread	10
				Shadscale	5
				Bud sagebrush	5
				Winterfat	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
60---------- Sazi	Semidesert Loam (Wyoming Big Sagebrush).	Favorable Normal Unfavorable	900 700 500	Indian ricegrass---------- Wyoming big sagebrush--------- Bottlebrush squirreltail------ Galleta---------- Needleandthread---------- Globemallow---------- Winterfat----------	20 20 10 10 10 5 5
61*: Sazi----------	Semidesert Loam (Wyoming Big Sagebrush).	Favorable Normal Unfavorable	900 700 500	Indian ricegrass---------- Wyoming big sagebrush--------- Bottlebrush squirreltail------ Galleta---------- Needleandthread---------- Globemallow---------- Winterfat----------	20 20 10 10 10 5 5
Shalako----------	Semidesert Shallow Loam (Utah Juniper-Pinyon)**.	Favorable Normal Unfavorable	350 250 150	Salina wildrye---------- Black sagebrush---------- Bluebunch wheatgrass---------- Mormon-tea---------- Galleta----------	20 20 10 10 5
Mido----------	Semidesert Sand----------	Favorable Normal Unfavorable	800 600 300	Indian ricegrass---------- Needleandthread---------- Fourwing saltbush---------- Dropseed---------- Sandhill muhly---------- Galleta---------- Sand sagebrush---------- Munro globemallow---------- Finebranched eriogonum-------- Mormon-tea----------	20 10 10 5 5 5 5 5 5 5
62---------- Shalako	Semidesert Shallow Loam (Utah Juniper-Pinyon)**.	Favorable Normal Unfavorable	350 250 150	Salina wildrye---------- Black sagebrush---------- Bluebunch wheatgrass---------- Mormon-tea---------- Galleta----------	20 20 10 10 5
63---------- Shalako	Upland Shallow Loam (Pinyon-Utah Juniper)**.	Favorable Normal Unfavorable	500 400 300	Mexican cliffrose---------- Birchleaf mountainmahogany---- Indian ricegrass---------- Salina wildrye---------- Mormon-tea---------- Black sagebrush----------	15 15 10 10 10 5
64---------- Shalet	Desert Shallow Loam (Shadscale).	Favorable Normal Unfavorable	500 300 200	Shadscale---------- Galleta---------- Bud sagebrush---------- Indian ricegrass---------- Mormon-tea---------- Wedgeleaf saltbush----------	30 15 10 5 5 5
65*: Shalet----------	Desert Shallow Loam (Shadscale).	Favorable Normal Unfavorable	500 300 200	Shadscale---------- Galleta---------- Bud sagebrush---------- Indian ricegrass---------- Mormon-tea---------- Wedgeleaf saltbush----------	30 15 10 5 5 5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
65*:					
Nakai	Desert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	550	Galleta	10
		Unfavorable	350	Fourwing saltbush	10
				Globemallow	10
				Shadscale	10
				Winterfat	5
				Torrey Mormon-tea	5
				Sand dropseed	5
				Locoweed	5
66	Desert Sand	Favorable	800	Indian ricegrass	30
Sheppard		Normal	500	Fourwing saltbush	15
		Unfavorable	300	Galleta	10
				Needleandthread	10
				Mormon-tea	5
				Sand dropseed	5
				Winterfat	5
				Spike dropseed	5
67	Mountain Loam (Oak)	Favorable	1,750	Gambel oak	30
Skylick		Normal	1,200	Snowberry	10
		Unfavorable	650	Bluegrass	10
				Wheatgrass	5
				Mountain big sagebrush	5
				Serviceberry	5
69	Semidesert Stony Loam (Utah Juniper-Pinyon)**.	Favorable	650	Needleandthread	10
Strych		Normal	500	Galleta	10
		Unfavorable	350	Birchleaf mountainmahogany	10
				Black sagebrush	10
				Mormon-tea	10
				Salina wildrye	5
				Bluebunch wheatgrass	5
				Indian ricegrass	5
				Bottlebrush squirreltail	5
70*:					
Sula family	Mountain Very Steep Loam (Douglas-fir)**.	Favorable	400	Sedge	15
		Normal	250	Gambel oak	15
		Unfavorable	100	Snowberry	15
				Bluegrass	5
				Utah serviceberry	5
				Birchleaf mountainmahogany	5
Razorba family	Mountain Very Steep Loam (Oak)	Favorable	1,400	Gambel oak	30
		Normal	1,000	Bluegrass	10
		Unfavorable	600	Snowberry	10
				Serviceberry	5
				Wheatgrass	5
				Mountain big sagebrush	5
71*	Semidesert Very Steep Loam (Wyoming Big Sagebrush).	Favorable	800	Indian ricegrass	20
Thedalund family		Normal	600	Wyoming big sagebrush	20
		Unfavorable	400	Galleta	10
				Bottlebrush squirreltail	10
				Needleandthread	10
				Globemallow	5
				Winterfat	5
72*	Semidesert Very Steep Loam (Utah Juniper-Pinyon)**.	Favorable	250	Salina wildrye	20
Thedalund family		Normal	200	Black sagebrush	20
		Unfavorable	100	Bluebunch wheatgrass	10
				Mormon-tea	10
				Galleta	5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
73* Thedalund family	Semidesert Very Steep Loam (Salina Wildrye).	Favorable Normal Unfavorable	600 500 350	Shadscale Salina wildrye Galleta Western wheatgrass	30 25 10 5
75*: Toddler family	Alkali Fan	Favorable Normal Unfavorable	500 300 200	Galleta Wedgeleaf saltbush Indian ricegrass Globemallow Bud sagebrush Winterfat	20 20 15 5 5 5
Ravola family	Alkali Flat	Favorable Normal Unfavorable	1,000 700 500	Black greaseweed Shadscale Bottlebrush squirreltail Alkali sacaton Galleta Indian ricegrass Seepweed	30 10 10 10 5 5 5
Glenton family	Alkali Fan	Favorable Normal Unfavorable	500 300 200	Galleta Wedgeleaf saltbush Indian ricegrass Globemallow Bud sagebrush Winterfat	20 20 15 5 5 5
76*: Valleycity	Desert Shallow Sandy Loam	Favorable Normal Unfavorable	350 250 100	Galleta Indian ricegrass Shadscale Blackbrush Sand dropseed Mormon-tea Winterfat	20 15 15 5 5 5 5
Neiber	Desert Loam	Favorable Normal Unfavorable	700 500 300	Indian ricegrass Shadscale Galleta Bud sagebrush Winterfat Globemallow	20 20 10 5 5 5
Rock outcrop.					
77* Walknolls	Desert Very Steep Shallow Loam (Shadscale).	Favorable Normal Unfavorable	400 250 150	Shadscale Galleta Wedgeleaf saltbush Salina wildrye Bud sagebrush	30 15 15 5 5
78*: Windwhistle	Upland Loam (Basin Big Sagebrush).	Favorable Normal Unfavorable	1,300 1,100 800	Wyoming big sagebrush Western wheatgrass Needleandthread Indian ricegrass Muttongrass Fourwing saltbush	15 15 10 10 10 5

See footnote at end of table.

TABLE 5.--RANGELAND AND WOODLAND UNDERSTORY PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Grazing site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
78*:					
Begay	Semidesert Sandy Loam	Favorable	700	Indian ricegrass	20
		Normal	500	Needleandthread	15
		Unfavorable	300	Galleta	10
				Fourwing saltbush	10
				Mormon-tea	10
				Sand dropseed	10
				Winterfat	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
1*: Abra	Moderate: slope.	Moderate: slope.	Slight	Moderate: percs slowly, slope.	Moderate: slope, frost action.	Moderate: slope.
Barx	Slight	Slight	Severe: erodes easily.	Moderate: percs slowly.	Moderate: shrink-swell, frost action.	Moderate: shrink-swell.
2 Barx	Slight	Slight	Severe: erodes easily.	Moderate: percs slowly.	Moderate: shrink-swell, frost action.	Moderate: shrink-swell.
3 Begay Variant	Moderate: slope.	Moderate: slope.	Slight	Moderate: slope.	Moderate: slope, frost action.	Moderate: slope.
4*: Begay	Slight	Slight	Severe: erodes easily.	Slight	Slight	Slight.
Sazi	Slight	Slight	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
5*: Begay	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.	Severe: slope.	Severe: slope.
Sazi	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Rizno	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
6*: Begay	Slight	Slight	Severe: erodes easily.	Slight	Slight	Slight.
Rizno	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
7*: Blueflat	Moderate: slope, dusty.	Moderate: slope, dusty.	Slight	Severe: depth to rock, percs slowly.	Severe: low strength, shrink-swell.	Severe: shrink-swell.
Blueflat, saline-	Moderate: slope, dusty.	Moderate: slope, dusty.	Moderate: dusty.	Severe: depth to rock, percs slowly.	Severe: low strength, shrink-swell.	Severe: shrink-swell.
8*: Blueflat	Moderate: slope, dusty.	Moderate: slope, dusty.	Slight	Severe: depth to rock, percs slowly.	Severe: low strength, shrink-swell.	Severe: shrink-swell.
Neiber	Moderate: slope, dusty.	Severe: excess humus.	Severe: erodes easily.	Severe: depth to rock, percs slowly.	Severe: low strength.	Moderate: shrink-swell, slope.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
9*:						
Bookcliff	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.
Shalako	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
10 Chipeta	Severe: slope, depth to rock, excess salt.	Severe: slope, excess salt, depth to rock.	Severe: erodes easily.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
11*:						
Chipeta	Severe: depth to rock, excess salt.	Severe: excess salt, depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Severe: low strength.	Moderate: shrink-swell, depth to rock.
Chipeta, thick	Severe: depth to rock, excess salt.	Severe: excess salt, depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Severe: low strength.	Moderate: shrink-swell, depth to rock.
12*:						
Chipeta	Severe: slope, depth to rock, excess salt.	Severe: slope, excess salt, depth to rock.	Severe: slope, erodes easily.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
Badland.						
13* Dast family	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
14*:						
Dune land.						
Aneth family	Slight	Slight	Slight	Severe: poor filter.	Slight	Slight.
15*:						
Factory	Slight	Slight	Slight	Severe: cemented pan.	Moderate: cemented pan, frost action.	Moderate: cemented pan.
Pastern	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.
16*:						
Firth family	Severe: flooding, wetness.	Moderate: flooding, wetness.	Moderate: wetness, flooding.	Severe: flooding, wetness, percs slowly.	Severe: flooding, frost action.	Severe: flooding, wetness.
Plite family	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
17 Flatnose	Severe: flooding.	Slight	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
18*: Hanksville family-	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope	Severe: depth to rock, percs slowly, slope.	Severe: low strength, slope, shrink-swell.	Severe: shrink-well, slope.
Badland.						
19*: Hanksville family-	Severe: slope.	Severe: slope.	Severe: slope.	Severe: depth to rock, percs slowly, slope.	Severe: low strength, slope, shrink-swell.	Severe: shrink-swell, slope.
Shalet	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
20*: Hostage	Moderate: slope, small stones.	Moderate: slope, small stones.	Slight	Severe: percs slowly.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, slope.
Barx	Slight	Slight	Severe: erodes easily.	Moderate: percs slowly.	Moderate: shrink-swell, frost action.	Moderate: shrink-swell.
21*: Hostage	Moderate: slope, small stones.	Moderate: slope, small stones.	Slight	Severe: percs slowly.	Moderate: slope, shrink-swell.	Moderate: shrink-swell, slope.
Chipeta	Severe: depth to rock, excess salt.	Severe: excess salt, depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Severe: low strength.	Moderate: shrink-swell, depth to rock.
22* Hub family	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: slope.	Severe: slope.
23- Killpack	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.	Severe: depth to rock, percs slowly.	Severe: low strength.	Moderate: shrink-swell.
24*: Killpack	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: depth to rock, percs slowly, slope.	Severe: low strength, slope.	Severe: slope.
Chipeta	Severe: slope, depth to rock, excess salt.	Severe: slope, excess salt, depth to rock.	Severe: erodes easily.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
25*: Killpack	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.	Severe: depth to rock, percs slowly.	Severe: low strength.	Moderate: shrink-swell.
Blueflat	Moderate: slope, dusty.	Moderate: slope, dusty.	Slight	Severe: depth to rock, percs slowly.	Severe: low strength, shrink-swell.	Severe: shrink-swell.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
26---------- Leeko	Moderate: percs slowly.	Moderate: percs slowly.	Slight---------	Severe: percs slowly.	Moderate: shrink-swell.	Moderate: shrink-swell.
27*: Lockerby----------	Moderate: slope, large stones.	Moderate: slope, large stones.	Moderate: large stones.	Severe: depth to rock, percs slowly.	Severe: low strength, shrink-swell.	Severe: shrink-swell.
Shalako----------	Severe: depth to rock.	Severe: depth to rock.	Slight---------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
28---------- Mack	Moderate: dusty.	Moderate: dusty.	Slight---------	Moderate: percs slowly.	Slight---------	Slight.
29*: Mack----------	Moderate: dusty.	Moderate: dusty.	Slight---------	Moderate: percs slowly.	Slight---------	Slight.
Mack, overwash----	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.	Moderate: percs slowly.	Slight---------	Slight.
Sagers----------	Moderate: dusty, excess salt.	Moderate: excess salt, dusty.	Severe: erodes easily.	Severe: percs slowly.	Severe: low strength.	Moderate: shrink-swell.
30---------- Mesa	Slight---------	Slight---------	Slight---------	Severe: percs slowly, poor filter.	Slight---------	Slight.
31*: Mesa----------	Slight---------	Slight---------	Slight---------	Severe: percs slowly, poor filter.	Slight---------	Slight.
Chipeta----------	Severe: slope, depth to rock, excess salt.	Severe: slope, excess salt, depth to rock.	Severe: slope, erodes easily.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
Thedalund family--	Severe: slope.	Severe: slope.	Severe: large stones.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
32*: Mesa----------	Slight---------	Slight---------	Slight---------	Severe: percs slowly, poor filter.	Slight---------	Slight.
Trook----------	Slight---------	Slight---------	Slight---------	Moderate: percs slowly.	Slight---------	Slight.
33---------- Mido	Moderate: slope.	Moderate: slope.	Severe: erodes easily.	Severe: poor filter.	Moderate: slope.	Moderate: slope.
34*: Mido----------	Moderate: slope.	Moderate: slope.	Severe: erodes easily.	Severe: poor filter.	Moderate: slope.	Moderate: slope.
Sazi----------	Slight---------	Slight---------	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
35*: Moenkopie	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop.						
36*: Moenkopie	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Shalako	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Sandoval	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock, low strength, slope.	Moderate: shrink-swell, slope, depth to rock.
37--- Moepitz Variant	Moderate: large stones.	Moderate: large stones.	Severe: large stones.	Moderate: depth to rock.	Slight	Slight.
38*: Muff family	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: depth to rock, percs slowly, slope.	Severe: slope.	Severe: slope.
Badland.						
39*: Myton family	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: depth to rock, slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
Rock outcrop.						
40--- Nakai	Slight	Slight	Slight	Moderate: depth to rock.	Slight	Slight.
41*: Nakai	Slight	Slight	Slight	Moderate: depth to rock.	Slight	Slight.
Moenkopie	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
42*: Nakai	Slight	Slight	Slight	Moderate: depth to rock.	Slight	Slight.
Redlands	Slight	Slight	Severe: erodes easily.	Moderate: depth to rock.	Slight	Slight.
43*: Nakai	Slight	Slight	Slight	Moderate: depth to rock.	Slight	Slight.
Sheppard	Slight	Slight	Slight	Severe: poor filter.	Slight	Slight.
44--- Pennell	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
45*---------- Razorba family	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
46*---------- Redbank family	Severe: flooding.	Slight---------	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.
47*: Redbank family----	Severe: flooding.	Slight---------	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.
Flatnose family---	Moderate: wetness.	Moderate: wetness.	Slight---------	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
48*: Redbank family----	Severe: flooding.	Slight---------	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.
Flatnose family---	Moderate: small stones.	Moderate: small stones.	Slight---------	Slight---------	Moderate: frost action.	Slight.
49*: Reva family-------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Falcon family-----	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: large stones, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
Rock outcrop.						
50*. Riverwash						
51*: Rizno----------	Severe: depth to rock.	Severe: depth to rock.	Slight---------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Begay----------	Slight---------	Slight---------	Severe: erodes easily.	Slight---------	Slight---------	Slight.
52*: Rizno----------	Severe: depth to rock.	Severe: depth to rock.	Slight---------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Rock outcrop.						
53*. Rock outcrop						
54*: Rock outcrop.						
Arches----------	Severe: depth to rock.	Severe: depth to rock.	Slight---------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Mido----------	Moderate: slope.	Moderate: slope.	Severe: erodes easily.	Severe: poor filter.	Moderate: slope.	Moderate: slope.
55*: Rock outcrop.						
Moenkopie---------	Severe: depth to rock.	Severe: depth to rock.	Slight---------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
56---------- Sagers	Moderate: dusty, excess salt.	Moderate: excess salt, dusty.	Severe: erodes easily.	Severe: percs slowly.	Severe: low strength.	Moderate: shrink-swell.
57*: Sandoval----------	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock, low strength, slope.	Moderate: shrink-swell, slope, depth to rock.
Strych----------	Slight---------	Slight---------	Slight---------	Moderate: large stones.	Moderate: frost action, large stones.	Moderate: large stones.
58*: Sandoval----------	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock, low strength, slope.	Moderate: shrink-swell, slope, depth to rock.
Killpack----------	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: depth to rock, percs slowly, slope.	Severe: low strength, slope.	Severe: slope.
59*: Sandoval----------	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock, low strength, slope.	Moderate: shrink-swell, slope, depth to rock.
Thedalund family--	Severe: slope.	Severe: slope.	Severe: large stones.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
60---------- Sazi	Slight---------	Slight---------	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
61*: Sazi----------	Slight---------	Slight---------	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Shalako----------	Severe: depth to rock.	Severe: depth to rock.	Slight---------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
Mido----------	Moderate: slope.	Moderate: slope.	Severe: erodes easily.	Severe: poor filter.	Moderate: slope.	Moderate: slope.
62---------- Shalako	Severe: depth to rock.	Severe: depth to rock.	Slight---------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.
63---------- Shalako	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
64---------- Shalet	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
65*: Shalet----------	Severe: depth to rock.	Severe: depth to rock.	Severe: erodes easily.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock.
Nakai----------	Slight---------	Slight---------	Slight---------	Moderate: depth to rock.	Slight---------	Slight.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
66---------- Sheppard	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: poor filter.	Slight---------	Slight.
67---------- Skylick	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.
68*. Slickens						
69---------- Strych	Slight---------	Slight---------	Slight---------	Moderate: large stones.	Moderate: frost action, large stones.	Moderate: large stones.
70*: Sula family-------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.
Razorba family----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
71*, 72*, 73*------ Thedalund family	Severe: slope.	Severe: slope.	Severe: large stones.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
74*: Thedalund family--	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: depth to rock, slope.	Severe: low strength, slope.	Severe: slope.
Rock outcrop.						
Badland.						
75*: Toddler family----	Severe: flooding.	Moderate: excess salt.	Slight---------	Moderate: flooding, percs slowly.	Moderate: flooding.	Severe: flooding.
Ravola family-----	Severe: flooding.	Moderate: excess salt, percs slowly.	Severe: erodes easily.	Severe: flooding, percs slowly.	Severe: low strength, flooding.	Severe: flooding.
Glenton family----	Severe: flooding.	Slight---------	Slight---------	Moderate: flooding.	Moderate: flooding.	Severe: flooding.
76*: Valleycity--------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: large stones, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.
Neiber----------	Moderate: slope, dusty.	Severe: excess humus.	Severe: erodes easily.	Severe: depth to rock, percs slowly.	Severe: low strength.	Moderate: shrink-swell, slope.
Rock outcrop.						
77*---------- Walknolls family	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: depth to rock. slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.

See footnote at end of table.

TABLE 6.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Paths and trails	Septic tank absorption fields	Local roads and streets	Dwellings without basements
78*:						
Windwhistle	Slight	Slight	Severe: erodes easily.	Severe: depth to rock, poor filter.	Moderate: frost action.	Slight.
Begay	Slight	Slight	Severe: erodes easily.	Slight	Slight	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1*:				
Abra	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
Barx	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
2				
Barx	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
3	Good	Probable	Probable	Poor: small stones, area reclaim.
Begay Variant				
4*:				
Begay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Sazi	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
5*:				
Begay	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sazi	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Rizno	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
6*:				
Begay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Rizno	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
7*:				
Blueflat	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Blueflat, saline	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
8*:				
Blueflat	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
8*:				
Neiber	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
9*:				
Bookcliff	Fair: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Shalako	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
10 Chipeta	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
11*:				
Chipeta	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
Chipeta, thick	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
12*:				
Chipeta	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
Badland.				
13* Dast family	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
14*:				
Dune land.				
Aneth family	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones, area reclaim.
15*:				
Factory	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Pastern	Poor: cemented pan.	Improbable: excess fines.	Improbable: excess fines.	Poor: cemented pan, small stones.
16*:				
Firth family	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Plite family	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
17--- Flatnose	Good---	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
18*: Hanksville family----	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Badland.				
19*: Hanksville family----	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Shalet---	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
20*: Hostage---	Fair: area reclaim, thin layer, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Barx---	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
21*: Hostage---	Fair: area reclaim, thin layer, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Chipeta---	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
22*--- Hub family	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
23--- Killpack	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
24*: Killpack---	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Chipeta---	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
25*: Killpack---	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
25*: Blueflat	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
26 Leeko	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
27*: Lockerby	Poor: depth to rock, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Shalako	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
28 Mack	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
29*: Mack	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Mack, overwash	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Sagers	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: excess salt.
30 Mesa	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
31*: Mesa	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Chipeta	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, excess salt.
Thedalund family	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
32*: Mesa	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Trook	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
33 Mido	Good	Probable	Improbable: too sandy.	Poor: thin layer.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
34*:				
Mido	Good	Probable	Improbable: too sandy.	Poor: thin layer.
Sazi	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
35*:				
Moenkopie	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
36*:				
Moenkopie	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Shalako	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Sandoval	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
37--- Moepitz Variant	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
38*:				
Muff family	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Badland.				
39*:				
Myton family	Poor: depth to rock, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, slope.
Rock outcrop.				
40--- Nakai	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
41*:				
Nakai	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
Moenkopie	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
42*:				
Nakai	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
42*:				
Redlands	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
43*:				
Nakai	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sheppard	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
44 Pennell	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
45* Razorba family	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
46* Redbank family	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
47*:				
Redbank family	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Flatnose family	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
48*:				
Redbank family	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Flatnose family	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
49*:				
Reva family	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Falcon family	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones, slope.
Rock outcrop.				
50*. Riverwash				
51*:				
Rizno	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Begay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
52*:				
Rizno	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Rock outcrop.				
53*.				
Rock outcrop				
54*:				
Rock outcrop.				
Arches	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock.
Mido	Good	Probable	Improbable: too sandy.	Poor: thin layer.
55*:				
Rock outcrop.				
Moenkopie	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
56	Poor:	Improbable:	Improbable:	Fair:
Sagers	low strength.	excess fines.	excess fines.	excess salt.
57*:				
Sandoval	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Strych	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
58*:				
Sandoval	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Killpack	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
59*:				
Sandoval	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Thedalund family	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
60	Poor:	Improbable:	Improbable:	Fair:
Sazi	depth to rock.	excess fines.	excess fines.	depth to rock, small stones.
61*:				
Sazi	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
61*:				
Shalako	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Mido	Good	Probable	Improbable: too sandy.	Poor: thin layer.
62				
Shalako	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
63				
Shalako	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
64				
Shalet	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
65*:				
Shalet	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, small stones.
Nakai	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Good.
66				
Sheppard	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
67				
Skylick	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
68*.				
Slickens				
69				
Strych	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
70*:				
Sula family	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Razorba family	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
71*, 72*, 73*				
Thedalund family	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
74*:				
Thedalund family	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				

See footnote at end of table.

TABLE 7.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
74*: Badland.				
75*: Toddler	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Ravola	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Glenton	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
76*: Valleycity	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Neiber	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
Rock outcrop.				
77* Walknolls family	Poor: depth to rock, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: depth to rock, small stones, slope.
78*: Windwhistle	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Begay	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1*:											
Abra	0-2	Fine sandy loam	CL-ML, SM-SC	A-2, A-4	0-10	85-100	80-100	45-90	25-55	20-30	5-10
	2-7	Fine sandy loam, sandy clay loam, loam.	CL-ML, SM-SC, SM, ML	A-4	0	95-100	90-100	65-95	35-75	25-35	5-10
	7-23	Fine sandy loam, sandy clay loam.	CL-ML, SM-SC, SM, ML	A-4	0-10	85-100	80-100	55-90	35-60	25-35	5-10
	23-60	Sandy clay loam, sandy loam.	CL-ML, SM-SC, SM, ML	A-2, A-4	0-10	85-100	80-100	50-100	25-90	25-35	5-10
Barx	0-2	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	0	100	100	70-95	40-65	20-30	NP-10
	2-13	Fine sandy loam, clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	100	100	70-100	45-75	20-35	5-15
	13-33	Sandy clay loam, loam, clay loam.	SM-SC, SC, CL, CL-ML	A-4, A-6	0-10	80-100	75-100	60-100	35-75	20-40	5-20
	33-60	Sandy loam, sandy clay loam, loam.	SM-SC, CL, CL-ML, SC	A-2, A-4, A-6	0-10	80-100	75-100	45-95	30-70	20-35	5-15
2 Barx	0-2	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	0	100	100	70-95	40-65	20-30	NP-10
	2-13	Fine sandy loam, clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	100	100	70-100	45-75	20-35	5-15
	13-33	Sandy clay loam, loam, clay loam.	SM-SC, SC, CL, CL-ML	A-4, A-6	0-10	80-100	75-100	60-100	35-75	20-40	5-20
	33-60	Sandy loam, sandy clay loam, loam.	SM-SC, CL, CL-ML, SC	A-2, A-4, A-6	0-10	80-100	75-100	45-95	30-70	20-35	5-15
3 Begay Variant	0-2	Fine sandy loam	SM	A-4	0	100	95-100	65-90	35-50	---	NP
	2-11	Loam, fine sandy loam, sandy loam.	CL-ML, SM-SC	A-4, A-2	0	100	95-100	65-90	30-65	20-30	5-10
	11-19	Fine sandy loam, gravelly loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0-5	75-100	65-100	55-80	25-55	20-30	NP-10
	19-26	Gravelly fine sandy loam, gravelly sandy loam.	SM, SM-SC, GM, GM-GC	A-1, A-2, A-4	0	60-80	55-75	35-60	15-40	20-30	NP-10
	26-36	Fine sandy loam, loam.	SM, ML	A-4	0	90-100	85-100	60-85	35-65	---	NP
	36-60	Very gravelly fine sandy loam, gravelly loamy sand, very gravelly loamy sand.	GM, SM, GP-GM, SP-SM	A-1, A-2	0	45-70	40-65	25-50	10-30	---	NP
4*:											
Begay	0-5	Fine sandy loam	SM	A-4	0	100	100	70-85	40-50	20-25	NP-5
	5-26	Very fine sandy loam, fine sandy loam, sandy loam.	ML, CL-ML	A-4	0	100	100	80-95	50-65	20-30	NP-10
	26-60	Very fine sandy loam, loamy fine sand, fine sandy loam.	ML, SM	A-4, A-2	0	100	100	75-95	30-60	---	NP

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
4*:											
Sazi	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	90-100	65-90	35-55	15-25	NP-10
	4-17	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	70-95	40-60	15-25	NP-10
	17-34	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	65-95	35-65	15-25	NP-10
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
5*:											
Begay	0-5	Fine sandy loam	SM	A-4	0	100	100	70-85	40-50	20-25	NP-5
	5-26	Very fine sandy loam, fine sandy loam, sandy loam.	ML, CL-ML	A-4	0	100	100	80-95	50-65	20-30	NP-10
	26-60	Very fine sandy loam, loamy fine sand, fine sandy loam.	ML, SM	A-4, A-2	0	100	100	75-95	30-60	---	NP
Sazi	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	90-100	65-90	35-55	15-25	NP-10
	4-17	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	70-95	40-60	15-25	NP-10
	17-34	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	65-95	35-65	15-25	NP-10
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rizno	0-2	Fine sandy loam	SM, SM-SC	A-4, A-2	0-10	95-100	90-100	65-85	30-50	20-30	NP-10
	2-8	Gravelly fine sandy loam, channery fine sandy loam, channery loam.	SM, SM-SC	A-2, A-4	0-15	65-80	60-75	40-55	25-40	20-30	NP-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
6*:											
Begay	0-5	Fine sandy loam	SM	A-4	0	100	100	70-85	40-50	20-25	NP-5
	5-26	Very fine sandy loam, fine sandy loam, sandy loam.	ML, CL-ML	A-4	0	100	100	80-95	50-65	20-30	NP-10
	26-60	Very fine sandy loam, loamy fine sand, fine sandy loam.	ML, SM	A-4, A-2	0	100	100	75-95	30-60	---	NP

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
6*:											
Rizno----------	0-2	Fine sandy loam	SM, SM-SC	A-4, A-2	0-10	95-100	90-100	65-85	30-50	20-30	NP-10
	2-8	Gravelly fine sandy loam, channery fine sandy loam, channery loam.	SM, SM-SC	A-2, A-4	0-15	65-80	60-75	40-55	25-40	20-30	NP-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
7*:											
Blueflat--------	0-6	Loam----------	CL-ML	A-4	0-5	95-100	90-100	80-90	55-75	20-30	5-10
	6-27	Silty clay, clay, silty clay loam.	CL, CH	A-6, A-7	0-5	95-100	90-95	90-95	80-90	35-55	15-30
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Blueflat, saline	0-4	Loam----------	CL-ML	A-4	0-5	95-100	90-100	80-90	55-75	20-30	5-10
	4-16	Silty clay loam	CL	A-6	0-5	95-100	90-100	85-95	75-95	30-40	10-15
	16-28	Clay----------	CL, CH	A-6, A-7	0-5	95-100	90-95	90-95	80-90	35-55	15-30
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
8*:											
Blueflat--------	0-2	Loam----------	CL-ML	A-4	0-5	95-100	90-100	80-90	55-75	20-30	5-10
	2-35	Silty clay, clay, silty clay loam.	CL, CH	A-6, A-7	0-5	95-100	90-95	90-95	80-90	35-55	15-30
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
Neiber----------	0-3	Silt loam--------	CL-ML	A-4	0-10	85-100	80-100	65-100	50-90	25-35	5-10
	3-12	Silty clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-100	55-85	25-35	5-15
	12-32	Silty clay loam, clay loam.	CL	A-6	0-10	90-100	85-100	80-100	60-95	30-40	10-15
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
9*:											
Bookcliff-------	0-4	Sandy loam-------	SM-SC, SM, SC	A-4, A-2, A-6	0-5	100	100	80-90	30-50	20-35	NP-15
	4-12	Clay loam, sandy clay loam, loam.	CL, CL-ML	A-4, A-6	0	100	100	70-95	50-70	25-35	5-15
	12-32	Loam, clay loam, silty clay loam.	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	65-100	50-80	25-40	5-20
	32-51	Channery clay loam, clay loam, loam.	CL-ML, CL, GM-GC, GC	A-4, A-6	0-10	65-100	60-100	55-100	45-90	25-40	5-20
	51	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Shalako--------	0-3	Very stony fine sandy loam.	SM-SC, SM, GM, GM-GC	A-1, A-2	30-55	60-90	35-70	30-60	15-35	15-25	NP-10
	3-7	Fine sandy loam, loam, sandy loam.	SM-SC, CL-ML, SM, ML	A-4	0	90-100	80-95	65-90	35-70	15-25	NP-10
	7-17	Gravelly loam, gravelly sandy loam, cobbly loam.	SM-SC, SM	A-1, A-2, A-4	5-20	80-90	55-75	45-70	20-50	15-25	NP-10
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
10----------	0-3	Silty clay loam	CL	A-6	0	100	100	90-95	80-90	30-40	10-20
Chipeta	3-8	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	8	Weathered bedrock	---	---	---	---	---	---	---	---	---
11*:											
Chipeta---------	0-3	Silty clay loam	CL	A-6	0	100	100	90-95	80-90	30-40	10-20
	3-8	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	8	Weathered bedrock	---	---	---	---	---	---	---	---	---
Chipeta, thick--	0-2	Silty clay loam	CL	A-6	0	100	100	90-95	80-90	30-40	10-20
	2-18	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
12*:											
Chipeta---------	0-3	Silty clay loam	CL	A-6	0	100	100	90-95	80-90	30-40	10-20
	3-8	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	8	Weathered bedrock	---	---	---	---	---	---	---	---	---
Badland.											
13*----------	0-5	Bouldery sandy loam.	SM-SC, SM	A-1, A-2	25-85	65-95	55-90	35-65	20-35	20-30	NP-10
Dast family	5-16	Fine sandy loam	SM-SC, CL-ML, SM, ML	A-2, A-4	0-10	80-100	75-100	50-85	30-55	20-30	NP-10
	16-34	Channery loam, loam, gravelly sandy loam.	SM-SC, CL-ML, ML, SM	A-2, A-4, A-1	0-25	75-100	65-100	45-95	20-75	20-30	NP-10
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
14*:											
Dune land.											
Aneth family----	0-4	Loamy fine sand	SM	A-2, A-4	0	90-100	75-100	40-95	25-40	---	NP
	4-12	Loamy sand, loamy fine sand, loamy coarse sand.	SM	A-2, A-1	0	90-100	75-100	40-95	20-30	---	NP
	12-60	Loamy sand, loamy fine sand, fine sandy loam.	SM	A-2, A-4	0-10	90-100	75-100	50-90	25-50	20-25	NP-5
15*:											
Factory---------	0-4	Fine sandy loam	SM	A-2, A-4	0-5	85-100	80-100	45-70	25-50	20-25	NP-5
	4-22	Fine sandy loam, gravelly fine sandy loam, gravelly loam.	SM, SM-SC, GM-GC, GM	A-2, A-4	0-5	60-95	55-90	35-75	25-50	20-30	NP-10
	22-34	Gravelly fine sandy loam, gravelly sandy loam, gravelly loam.	SM, SM-SC, GM-GC, GM	A-2, A-4, A-1	0-15	55-80	50-75	30-60	15-50	20-30	NP-10
	34	Indurated--------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
15*:											
Pastern	0-1	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	95-100	70-85	30-45	20-30	NP-10
	1-18	Fine sandy loam, gravelly fine sandy loam, gravelly loam.	SM, SM-SC	A-2, A-4	0-10	75-100	70-100	50-85	20-50	20-30	NP-10
	18	Indurated	---	---	---	---	---	---	---	---	---
16*:											
Firth family	0-14	Sandy loam	SM-SC, SM	A-2, A-4	0-10	85-100	80-100	40-80	20-50	20-30	NP-10
	14-45	Loam, sandy loam	ML, SM-SC, SM, CL-ML	A-2, A-4	0-10	85-100	80-100	50-90	30-60	20-30	NP-10
	45-60	Clay loam, silty clay loam, fine sandy loam.	CL-ML, CL	A-4, A-6	0-10	85-100	80-100	70-100	50-90	25-40	5-20
Plite family	0-12	Sandy loam	SM, ML	A-2, A-4	0-5	80-100	75-100	40-80	30-60	20-25	NP-5
	12-60	Loam, sandy loam, gravelly loam.	SM-SC, ML, SM, CL-ML	A-2, A-4	0-10	75-100	70-100	35-80	25-60	20-30	NP-10
17	0-4	Sandy loam	SM	A-2, A-4	0-10	90-100	85-100	55-75	25-50	---	NP
Flatnose	4-60	Stratified fine sandy loam to gravelly sandy loam.	SM-SC, SM	A-2, A-4	0-10	65-95	60-90	40-70	30-50	20-30	NP-10
18*:											
Hanksville family	0-3	Extremely bouldery silt loam.	SM-SC, ML, CL-ML	A-2, A-4, A-1	65-85	60-85	50-80	30-80	15-70	20-35	NP-10
	3-14	Silt loam, silty clay loam, clay loam.	CL	A-7, A-6	0	100	90-100	85-100	75-95	30-45	10-20
	14-35	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-35
	35	Weathered bedrock	---	---	---	---	---	---	---	---	---
Badland.											
19*:											
Hanksville family	0-3	Flaggy loam	SM-SC, GM-GC, CL-ML, CL	A-4, A-7, A-6	15-40	65-85	60-85	50-80	35-75	25-45	5-20
	3-12	Silt loam, silty clay loam, clay loam.	CL	A-7, A-6	0	100	90-100	85-100	75-95	30-45	10-20
	12-27	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	90-95	40-55	20-35
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Shalet	0-3	Loam	SM-SC, CL-ML, ML, SM	A-4	0-5	80-100	75-100	60-95	45-75	20-30	NP-10
	3-7	Clay loam	CL	A-6	0-5	80-100	75-100	70-100	55-80	30-40	10-20
	7	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
20*:											
Hostage	0-3	Gravelly fine sandy loam.	SM-SC, GM-GC, SM, GM	A-2, A-4	0-10	55-80	50-75	35-65	25-50	20-30	NP-10
	3-24	Gravelly loam, gravelly sandy clay loam, gravelly clay loam.	SM-SC, GM-GC, SC, GC	A-2, A-4, A-6	0-10	55-80	50-75	35-65	20-50	25-35	5-15
	24-32	Gravelly clay loam, gravelly sandy clay loam, clay loam.	CL, SC	A-6	0-10	80-100	70-95	55-90	35-85	30-40	10-15
	32-42	Silty clay	CL	A-6, A-7	0	100	90-100	90-100	85-95	35-50	15-30
	42	Weathered bedrock	---	---	---	---	---	---	---	---	---
Barx	0-2	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	0	100	100	70-95	40-65	20-30	NP-10
	2-22	Fine sandy loam, clay loam, loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	100	100	70-100	45-75	20-35	5-15
	22-33	Sandy clay loam, loam, clay loam.	SM-SC, SC, CL, CL-ML	A-4, A-6	0-10	80-100	75-100	60-100	35-75	20-40	5-20
	33-60	Sandy loam, sandy clay loam, loam.	SM-SC, CL, CL-ML, SC	A-2, A-4, A-6	0-10	80-100	75-100	45-95	30-70	20-35	5-15
21*:											
Hostage	0-3	Gravelly fine sandy loam.	SM-SC, GM-GC, SM, GM	A-2, A-4	0-10	55-80	50-75	35-65	25-50	20-30	NP-10
	3-24	Gravelly loam, gravelly sandy clay loam, gravelly clay loam.	SM-SC, GM-GC, SC, GC	A-2, A-4, A-6	0-10	55-80	50-75	35-65	20-50	25-35	5-15
	24-32	Gravelly clay loam, gravelly sandy clay loam, clay loam.	CL, SC	A-6	0-10	80-100	70-95	55-90	35-85	30-40	10-15
	32-42	Silty clay	CL	A-6, A-7	0	100	90-100	90-100	85-95	35-50	15-30
	42	Weathered bedrock	---	---	---	---	---	---	---	---	---
Chipeta	0-3	Silty clay loam	CL	A-6	0	100	100	90-95	80-90	30-40	10-20
	3-8	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	8	Weathered bedrock	---	---	---	---	---	---	---	---	---
22* Hub family	0-6	Very stony sandy loam.	SM-SC, SM, CL-ML	A-1, A-2, A-4	25-55	55-90	50-85	35-85	15-60	20-30	NP-10
	6-31	Stony sandy loam, gravelly sandy clay loam, sandy loam.	SC, GC	A-2, A-6	0-30	65-100	55-100	35-75	15-45	30-40	10-20
	31-60	Cobbly sandy loam, gravelly sandy loam, channery loam.	SM-SC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	65-100	55-90	35-70	15-65	25-35	5-15
23 Killpack	0-4	Silt loam	CL, CL-ML, ML	A-4, A-6	0	90-100	85-100	75-100	60-95	20-35	NP-15
	4-23	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	20-40	5-15
	23-38	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	25-40	5-15
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
24*:											
Killpack	0-4	Silty clay loam	CL, CL-ML	A-4, A-6	0	90-100	85-100	70-100	55-90	20-35	5-15
	4-23	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	20-40	5-15
	23-36	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	25-40	5-15
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
Chipeta	0-3	Silty clay loam	CL	A-6	0	100	100	90-95	80-90	30-40	10-20
	3-8	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	8	Weathered bedrock	---	---	---	---	---	---	---	---	---
25*:											
Killpack	0-4	Silt loam	CL, CL-ML, ML	A-4, A-6	0	90-100	85-100	75-100	60-95	20-35	NP-15
	4-23	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	20-40	5-15
	23-38	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	25-40	5-15
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---
Blueflat	0-6	Loam	CL-ML	A-4	0-5	95-100	90-100	80-90	55-75	20-30	5-10
	6-27	Silty clay, clay, silty clay loam.	CL, CH	A-6, A-7	0-5	95-100	90-95	90-95	80-90	35-55	15-30
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
26	0-2	Fine sandy loam	SM	A-4	0	100	100	70-85	35-50	---	NP
Leeko	2-20	Loam	CL	A-6	0	100	100	95-100	65-80	25-35	10-15
	20-33	Sandy loam, sandy clay loam.	SM-SC, CL-ML, SC, CL	A-4, A-6	0	100	100	70-90	45-60	20-30	5-15
	33-60	Silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-95	75-85	20-35	5-15
27*:											
Lockerby	0-3	Cobbly fine sandy loam.	SM, SM-SC	A-4, A-2	20-30	80-85	75-80	65-75	30-50	20-30	NP-10
	3-12	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-45	15-25
	12-28	Silty clay	CL, CH	A-7	0	100	100	95-100	90-95	45-55	20-30
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
Shalako	0-2	Very fine sandy loam.	SM-SC, SM, CL-ML, ML	A-4	0	90-100	80-100	65-95	35-60	15-25	NP-10
	2-15	Fine sandy loam, loam, sandy loam.	SM-SC, CL-ML, SM, ML	A-4	0	90-100	80-95	65-90	35-70	15-25	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
28	0-3	Loam	CL-ML, ML	A-4	0-5	95-100	90-100	75-95	50-70	20-30	NP-10
Mack	3-16	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-90	25-35	5-15
	16-60	Silt loam, loam, fine sandy loam.	CL-ML, ML	A-4	0-5	95-100	90-100	75-95	50-75	20-30	NP-10
29*:											
Mack	0-3	Loam	CL-ML, ML	A-4	0-5	95-100	90-100	75-95	50-70	20-30	NP-10
	3-16	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-90	25-35	5-15
	16-60	Silt loam, loam, fine sandy loam.	CL-ML, ML	A-4	0-5	95-100	90-100	75-95	50-75	20-30	NP-10

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
29*:											
Mack, overwash--	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	95-100	90-100	85-100	70-90	25-35	5-15
	8-26	Loam, clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-90	25-35	5-15
	26-60	Silt loam, loam, fine sandy loam.	CL-ML, ML	A-4	0-5	95-100	90-100	75-95	50-75	20-30	NP-10
Sagers----------	0-8	Silt loam--------	CL-ML	A-4	0	95-100	95-100	90-100	80-90	20-30	5-10
	8-60	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	75-95	30-40	10-20
30---------------	0-10	Fine sandy loam	SM, SM-SC	A-4	0-5	95-100	90-100	70-85	35-50	20-30	NP-10
Mesa	10-24	Loam, clay loam, sandy clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0-10	85-100	80-100	65-95	35-70	25-40	5-15
	24-54	Stratified gravelly loam to very gravelly fine sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2, A-4	5-25	45-75	40-70	25-55	15-40	20-30	NP-10
	54-60	Loam-------------	CL-ML, ML	A-4	0-10	85-100	80-95	70-90	55-70	20-30	NP-10
31*:											
Mesa----------	0-10	Fine sandy loam	SM, SM-SC	A-4	0-5	95-100	90-100	70-85	35-50	20-30	NP-10
	10-24	Loam, clay loam, sandy clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0-10	85-100	80-100	65-95	35-70	25-40	5-15
	24-54	Stratified gravelly loam to very gravelly fine sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2, A-4	5-25	45-75	40-70	25-55	15-40	20-30	NP-10
	54-60	Loam-------------	CL-ML, ML	A-4	0-10	85-100	80-95	70-90	55-70	20-30	NP-10
Chipeta---------	0-3	Silty clay loam	CL	A-6	0	100	100	90-95	80-90	30-40	10-20
	3-8	Silty clay loam, silty clay, clay.	CL	A-6, A-7	0	100	100	95-100	90-95	35-45	15-25
	8	Weathered bedrock	---	---	---	---	---	---	---	---	---
Thedalund family	0-4	Very bouldery loam.	SM-SC, SC	A-2	45-70	70-95	70-80	30-60	20-40	25-30	5-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-15	85-100	60-90	60-80	40-60	30-40	10-15
	9-24	Silty clay loam	CL	A-6	0	100	90-100	80-100	80-90	30-40	10-15
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---
32*:											
Mesa----------	0-10	Fine sandy loam	SM, SM-SC	A-4	0-5	95-100	90-100	70-85	35-50	20-30	NP-10
	10-24	Loam, clay loam, sandy clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6	0-10	85-100	80-100	65-95	35-70	25-40	5-15
	24-54	Stratified gravelly loam to very gravelly fine sandy loam.	GM, GM-GC, SM, SM-SC	A-1, A-2, A-4	5-25	45-75	40-70	25-55	15-40	20-30	NP-10
	54-60	Loam-------------	CL-ML, ML	A-4	0-10	85-100	80-95	70-90	55-70	20-30	NP-10
Trook----------	0-5	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0-5	85-100	80-100	60-90	35-55	20-30	NP-10
	5-32	Fine sandy loam, loam, gravelly loam.	SM, SM-SC, ML, CL-ML	A-4	0-5	80-100	75-100	55-95	35-75	20-30	NP-10
	32-60	Very gravelly sandy loam, very gravelly fine sandy loam, very gravelly loam.	GM-GC	A-1, A-2	5-20	35-65	30-55	15-50	10-35	15-30	NP-10

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
33---------- Mido	0-7	Loamy fine sand	SM	A-2, A-4	0	100	100	75-95	30-50	---	NP
	7-60	Loamy fine sand, fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-35	---	NP
34*:											
Mido----------	0-7	Loamy fine sand	SM	A-2, A-4	0	100	100	75-95	30-50	---	NP
	7-60	Loamy fine sand, fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-35	---	NP
Sazi----------	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	90-100	65-90	35-55	15-25	NP-10
	4-17	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	70-95	40-60	15-25	NP-10
	17-32	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	65-95	35-65	15-25	NP-10
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
35*:											
Moenkopie-------	0-2	Fine sandy loam	SM, SM-SC	A-4	0-5	95-100	95-100	65-85	35-45	15-25	NP-10
	2-19	Sandy loam, gravelly sandy loam, loam.	SM-SC	A-2, A-4	0-5	65-100	60-80	45-65	25-45	20-25	5-10
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
36*:											
Moenkopie-------	0-2	Fine sandy loam	SM, SM-SC	A-4	0-5	95-100	95-100	65-85	35-45	15-25	NP-10
	2-19	Sandy loam, gravelly sandy loam, loam.	SM-SC	A-2, A-4	0-5	65-100	60-80	45-65	25-45	20-25	5-10
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Shalako---------	0-1	Gravelly sandy loam.	SM-SC, SM	A-1, A-2	0-10	70-90	55-75	45-65	20-35	15-25	NP-10
	1-4	Fine sandy loam, loam, sandy loam.	SM-SC, CL-ML, SM, ML	A-4	0	90-100	80-95	65-90	35-70	15-25	NP-10
	4-10	Gravelly loam, gravelly sandy loam, cobbly loam.	SM-SC, SM	A-1, A-2, A-4	5-20	80-90	55-75	45-70	20-50	15-25	NP-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sandoval--------	0-2	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	55-95	25-40	5-15
	2-18	Silt loam, silty clay loam, clay loam.	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	50-95	25-40	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
37---------- Moepitz Variant	0-6	Very stony sandy loam.	SM, SM-SC	A-1, A-2	35-55	75-90	70-85	45-60	20-35	20-30	NP-10
	6-12	Gravelly loamy sand, cobbly coarse sandy loam.	SM, SM-SC	A-1, A-2	5-40	65-100	60-95	30-65	10-35	15-25	NP-10
	12-45	Sandy loam, coarse sandy loam, very fine sandy loam.	SM, SM-SC	A-2, A-4, A-1	0-10	80-100	75-100	40-70	15-40	15-25	NP-5
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
38*: Muff family-----	0-3	Very bouldery fine sandy loam.	GM, SM-SC, SM, GM-GC	A-1, A-2	25-40	40-75	35-70	20-60	10-35	20-30	NP-10
	3-23	Sandy clay loam, clay loam, silt loam.	SC, CL	A-6	0	80-100	75-100	70-100	40-85	30-40	10-20
	23-29	Sandy clay loam, clay loam, silty clay loam.	SC, CL	A-6	0	80-100	75-100	70-100	40-85	30-40	10-20
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
Badland.											
39*: Myton family----	0-6	Extremely stony sandy loam.	GM, SM	A-1, A-2	50-70	35-60	30-50	20-40	5-30	20-25	NP-5
	6-29	Extremely stony sandy loam, extremely cobbly loam.	GM, SM	A-1, A-2	35-70	35-60	30-50	20-40	5-30	20-25	NP-5
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
40---------- Nakai	0-3	Fine sandy loam	SM	A-4	0	100	100	80-95	40-60	15-25	NP-5
	3-58	Fine sandy loam	SM	A-4	0	100	100	80-95	40-60	15-25	NP-5
	58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
41*: Nakai----------	0-3	Loamy fine sand	SM	A-2, A-4	0	100	100	80-95	30-40	---	NP
	3-51	Fine sandy loam	SM	A-4	0	100	100	80-95	40-60	15-25	NP-5
	51	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Moenkopie-------	0-2	Fine sandy loam	SM, SM-SC	A-4	0-5	95-100	95-100	65-85	35-45	15-25	NP-10
	2-19	Sandy loam, gravelly sandy loam, loam.	SM-SC	A-2, A-4	0-5	65-100	60-80	45-65	25-45	20-25	5-10
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
42*: Nakai----------	0-3	Loamy fine sand	SM	A-2, A-4	0	100	100	80-95	30-40	---	NP
	3-51	Fine sandy loam	SM	A-4	0	100	100	80-95	40-60	15-25	NP-5
	51	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
42*:											
Redlands--------	0-8	Fine sandy loam	SM, ML	A-4	0	100	85-100	60-85	35-55	20-25	NP-5
	8-14	Sandy clay loam, fine sandy loam, loam.	SC, SM-SC, CL-ML, CL	A-4, A-6	0	95-100	90-100	65-95	35-75	25-35	5-15
	14-59	Fine sandy loam, gravelly fine sandy loam.	SM, SM-SC	A-2, A-4	0	75-100	70-100	50-85	30-50	20-30	NP-10
	59	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
43*:											
Nakai-----------	0-2	Loamy fine sand	SM	A-2, A-4	0	100	100	80-95	30-40	---	NP
	2-59	Fine sandy loam	SM	A-4	0	100	100	80-95	40-60	15-25	NP-5
	59	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sheppard--------	0-60	Loamy fine sand	SM	A-2	0	100	100	65-80	25-35	---	NP
44---------------	0-4	Sandy loam-------	SM, ML	A-4	0	100	100	70-85	40-55	20-30	NP-5
Pennell	4-7	Fine sandy loam, sandy loam, loam.	SM-SC, CL-ML, SM, ML	A-2, A-4	0	100	90-100	60-90	30-70	20-30	NP-10
	7-13	Sandy clay loam, gravelly sandy clay loam.	SM-SC, CL-ML	A-4	0-5	80-100	70-100	60-85	35-55	25-30	5-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
45*---------------	0-20	Fine sandy loam	SM-SC, CL-ML	A-2, A-4	0-20	70-100	65-100	35-95	15-75	20-30	5-10
Razorba family	20-60	Sandy clay loam, fine sandy loam, gravelly loam.	SM-SC, CL-ML	A-2, A-4	0-15	70-100	65-100	40-95	20-75	20-30	5-10
46*---------------	0-2	Sandy clay loam	SC, CL	A-6	0	100	90-100	60-90	40-75	30-40	10-20
Redbank family	2-60	Sandy loam, fine sandy loam, loam.	SM, SM-SC, CL-ML, ML	A-2, A-4	0-15	85-100	80-100	45-95	25-75	20-30	NP-10
47*:											
Redbank family--	0-8	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-2, A-4	0-20	75-100	70-100	50-95	30-65	20-30	NP-10
	8-13	Sandy loam, fine sandy loam, loam.	SM, SM-SC, CL-ML, ML	A-2, A-4	0-15	85-100	80-100	45-95	25-75	20-30	NP-10
	13-24	Gravelly loamy coarse sand, loamy fine sand.	SM	A-1, A-2	5-45	65-90	60-85	30-70	15-30	---	NP
	24-60	Stratified loam to loamy coarse sand.	SM, SM-SC, CL-ML, ML	A-2, A-4	0-20	85-100	80-100	55-75	30-55	20-30	NP-10
Flatnose family-	0-5	Sandy clay loam	CL, CL-ML, SC	A-4, A-6	0-10	90-100	85-100	70-90	40-60	25-35	5-15
	5-60	Fine sandy loam, sandy loam.	SM-SC, SM	A-2, A-4	0-10	90-100	85-100	80-100	30-50	15-25	NP-10
48*:											
Redbank family--	0-2	Sandy clay loam	SC, CL	A-6	0	100	90-100	60-90	40-75	30-40	10-20
	2-60	Sandy loam, fine sandy loam, loam.	SM, SM-SC, CL-ML, ML	A-2, A-4	0-15	85-100	80-100	45-95	25-75	20-30	NP-10

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
48*:											
Flatnose family-	0-6	Bouldery very fine sandy loam.	SM-SC, SM, ML, CL-ML	A-1, A-2, A-4	0-25	55-100	50-100	30-80	20-70	20-30	NP-10
	6-60	Stratified gravelly silt loam to fine sandy loam.	SM, SM-SC	A-2, A-4	0-15	70-80	65-75	55-70	30-50	20-30	NP-10
49*:											
Reva family-----	0-2	Very bouldery sandy loam.	SM	A-1, A-2	55-85	75-90	70-85	35-70	5-35	20-25	NP-5
	2-4	Fine sandy loam, gravelly sandy loam.	SM	A-1, A-2, A-4	0-10	75-95	65-90	35-70	20-40	20-25	NP-5
	4-8	Extremely gravelly sandy loam, extremely channery sandy loam, very channery loam.	GM	A-1, A-2	0-10	20-55	15-50	10-45	5-30	20-25	NP-5
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Falcon family---	0-2	Extremely bouldery sandy loam.	GM, GP-GM	A-1	50-70	40-55	35-50	25-30	5-15	---	NP
	2-19	Gravelly sandy loam, gravelly sandy clay loam, sandy loam.	SM, SM-SC, SC	A-2, A-4	0-5	80-100	60-100	45-80	25-50	20-35	NP-15
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
50*. Riverwash											
51*:											
Rizno-----------	0-2	Fine sandy loam	SM, SM-SC	A-4, A-2	0-10	95-100	90-100	65-85	30-50	20-30	NP-10
	2-8	Gravelly fine sandy loam, channery fine sandy loam, channery loam.	SM, SM-SC	A-2, A-4	0-15	65-80	60-75	40-55	25-40	20-30	NP-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Begay-----------	0-5	Fine sandy loam	SM	A-4	0	100	100	70-85	40-50	20-25	NP-5
	5-26	Very fine sandy loam, fine sandy loam, sandy loam.	ML, CL-ML	A-4	0	100	100	80-95	50-65	20-30	NP-10
	26-60	Very fine sandy loam, loamy fine sand, fine sandy loam.	ML, SM	A-4, A-2	0	100	100	75-95	30-60	---	NP

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
52*:											
Rizno	0-2	Fine sandy loam	SM, SM-SC	A-4, A-2	0-10	95-100	90-100	65-85	30-50	20-30	NP-10
	2-8	Gravelly fine sandy loam, channery fine sandy loam, channery loam.	SM, SM-SC	A-2, A-4	0-15	65-80	60-75	40-55	25-40	20-30	NP-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
53*.											
Rock outcrop											
54*:											
Rock outcrop.											
Arches	0-2	Loamy fine sand	SM	A-4	0	100	100	85-95	35-45	---	NP
	2-16	Loamy fine sand	SM	A-4	0	100	100	85-95	35-45	---	NP
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mido	0-7	Loamy fine sand	SM	A-2, A-4	0	100	100	75-95	30-50	---	NP
	7-60	Loamy fine sand, fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-35	---	NP
55*:											
Rock outcrop.											
Moenkopie	0-2	Fine sandy loam	SM, SM-SC	A-4	0-5	95-100	95-100	65-85	35-45	15-25	NP-10
	2-19	Sandy loam, gravelly sandy loam, loam.	SM-SC	A-2, A-4	0-5	65-100	60-80	45-65	25-45	20-25	5-10
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
56	0-8	Silt loam	CL-ML	A-4	0	95-100	95-100	90-100	80-90	20-30	5-10
Sagers	8-60	Silty clay loam, clay loam.	CL	A-6	0	95-100	95-100	95-100	75-95	30-40	10-20
57*:											
Sandoval	0-2	Silt loam	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	55-95	25-40	5-15
	2-18	Silt loam, silty clay loam, clay loam.	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	50-95	25-40	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Strych	0-6	Fine sandy loam	SM-SC	A-4	0-15	85-100	80-100	65-85	35-50	25-30	5-10
	6-11	Stony loam, stony sandy loam.	CL-ML, SM-SC, GM-GC	A-4	15-25	65-80	60-75	50-75	35-60	25-35	5-10
	11-48	Very stony loam, very stony sandy loam, very cobbly sandy loam.	SM-SC, GM-GC	A-4, A-2	20-40	60-85	50-80	40-65	20-45	25-30	5-10
	48-60	Stony sandy loam, sandy loam.	SM-SC	A-2, A-4	0-15	80-100	75-95	40-65	25-40	20-30	5-10

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
58*:											
Sandoval--------	0-2	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	55-95	25-40	5-15
	2-18	Silt loam, silty clay loam, clay loam.	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	50-95	25-40	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Killpack--------	0-4	Silty clay loam	CL, CL-ML	A-4, A-6	0	90-100	85-100	70-100	55-90	20-35	5-15
	4-23	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	20-40	5-15
	23-36	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	80-95	25-40	5-15
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
59*:											
Sandoval--------	0-2	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	55-95	25-40	5-15
	2-18	Silt loam, silty clay loam, clay loam.	CL-ML, CL	A-4, A-6	0-5	80-100	75-100	70-100	50-95	25-40	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Thedalund family	0-2	Very channery loam.	SM-SC, SC	A-2	45-70	70-95	70-80	30-60	20-40	25-30	5-10
	2-5	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-15	85-100	60-90	60-80	40-60	30-40	10-15
	5-27	Silty clay loam	CL	A-6	0	100	90-100	80-100	80-90	30-40	10-15
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
60---------- Sazi	0-1	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	90-100	65-90	35-55	15-25	NP-10
	1-5	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	70-95	40-60	15-25	NP-10
	5-27	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	65-95	35-65	15-25	NP-10
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
61*:											
Sazi----------	0-1	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	95-100	90-100	65-90	35-55	15-25	NP-10
	1-5	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	70-95	40-60	15-25	NP-10
	5-27	Fine sandy loam, very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	65-95	35-65	15-25	NP-10
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Shalako---------	0-1	Gravelly sandy loam.	SM-SC, SM	A-1, A-2	0-10	70-90	55-75	45-65	20-35	15-25	NP-10
	1-4	Fine sandy loam, loam, sandy loam.	SM-SC, CL-ML, SM, ML	A-4	0	90-100	80-95	65-90	35-70	15-25	NP-10
	4-14	Gravelly loam, gravelly sandy loam, cobbly loam.	SM-SC, SM	A-1, A-2, A-4	5-20	80-90	55-75	45-70	20-50	15-25	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
61*:											
Mido	0-7	Loamy fine sand	SM	A-2, A-4	0	100	100	75-95	30-50	---	NP
	7-60	Loamy fine sand, fine sand, loamy sand.	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-35	---	NP
62	0-1	Gravelly sandy loam.	SM-SC, SM	A-1, A-2	0-10	70-90	55-75	45-65	20-35	15-25	NP-10
Shalako	1-4	Fine sandy loam, loam, sandy loam.	SM-SC, CL-ML, SM, ML	A-4	0	90-100	80-95	65-90	35-70	15-25	NP-10
	4-10	Gravelly loam, gravelly sandy loam, cobbly loam.	SM-SC, SM	A-1, A-2, A-4	5-20	80-90	55-75	45-70	20-50	15-25	NP-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
63	0-2	Sandy loam	SM-SC, SM, CL-ML, ML	A-4	0	90-100	80-100	65-95	35-60	15-25	NP-10
Shalako	2-11	Fine sandy loam, loam, sandy loam.	SM-SC, CL-ML, SM, ML	A-4	0	90-100	80-95	65-90	35-70	15-25	NP-10
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
64	0-3	Loam	SM-SC, CL-ML, ML, SM	A-4	0-5	80-100	75-100	60-95	45-75	20-30	NP-10
Shalet	3-7	Clay loam	CL	A-6	0-5	80-100	75-100	70-100	55-80	30-40	10-20
	7	Weathered bedrock	---	---	---	---	---	---	---	---	---
65*:											
Shalet	0-3	Loam	SM-SC, CL-ML, ML, SM	A-4	0-5	80-100	75-100	60-95	45-75	20-30	NP-10
	3-7	Clay loam	CL	A-6	0-5	80-100	75-100	70-100	55-80	30-40	10-20
	7	Weathered bedrock	---	---	---	---	---	---	---	---	---
Nakai	0-3	Fine sandy loam	SM	A-4	0	100	100	80-95	40-60	15-25	NP-5
	3-57	Fine sandy loam	SM	A-4	0	100	100	80-95	40-60	15-25	NP-5
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
66	0-1	Fine sand	SM	A-2	0	100	100	65-80	10-20	---	NP
Sheppard	1-60	Loamy fine sand, fine sand, loamy sand.	SM	A-2	0	100	90-100	70-80	15-25	---	NP
67	0-21	Sandy loam	SM	A-2, A-4	0	95-100	90-100	55-70	30-40	20-25	NP-5
Skylick	21-30	Sandy loam, loam	SM-SC, SC, CL-ML, CL	A-4, A-6	0	95-100	90-100	60-90	35-75	25-35	5-15
	30-60	Sandy clay loam, clay loam.	SC, CL	A-2, A-6	0	90-100	85-100	55-85	30-70	30-40	10-20
68*.											
Slickens											

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
69---------- Strych	0-6	Fine sandy loam	SM-SC	A-4	0-15	85-100	80-100	65-85	35-50	25-30	5-10
	6-11	Stony loam, stony sandy loam.	CL-ML, SM-SC, GM-GC	A-4	15-25	65-80	60-75	50-75	35-60	25-35	5-10
	11-48	Very stony loam, very stony sandy loam, very cobbly sandy loam.	SM-SC, GM-GC	A-4, A-2	20-40	60-85	50-80	40-65	20-45	25-30	5-10
	48-60	Stony sandy loam, sandy loam.	SM-SC	A-2, A-4	0-15	80-100	75-95	40-65	25-40	20-30	5-10
70*:											
Sula family-----	0-3	Sandy loam-------	ML, SM	A-2, A-4	0-10	85-100	75-100	45-95	25-75	20-25	NP-5
	3-12	Sandy loam, loam, gravelly loam.	SM-SC, SM, ML, CL-ML	A-2, A-4	0-10	75-100	65-100	40-90	25-70	20-30	NP-10
	12-22	Loam, sandy loam, gravelly sandy loam.	SM-SC, SM, CL-ML	A-2, A-4	0-10	75-100	65-100	40-90	25-70	20-30	NP-10
	22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Razorba family--	0-8	Fine sandy loam	SM-SC, CL-ML	A-2, A-4	0-20	70-100	65-100	35-95	15-75	20-30	5-10
	8-60	Sandy clay loam, fine sandy loam, gravelly loam.	SM-SC, CL-ML	A-2, A-4	0-15	70-100	65-100	40-95	20-75	20-30	5-10
71*---------- Thedalund family	0-1	Very stony loam	SM-SC, SC	A-2	45-70	70-95	70-80	30-60	20-40	25-30	5-10
	1-10	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-15	85-100	60-90	60-80	40-60	30-40	10-15
	10-22	Silty clay loam	CL	A-6	0	100	90-100	80-100	80-90	30-40	10-15
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
72*---------- Thedalund family	0-2	Extremely channery loam.	SM-SC, SC	A-2	60-80	60-90	50-70	30-40	20-35	20-30	5-10
	2-13	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-15	85-100	60-90	60-80	40-60	30-40	10-15
	13-36	Silty clay loam	CL	A-6	0	100	90-100	80-100	80-90	30-40	10-15
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
73*---------- Thedalund family	0-1	Very bouldery loam.	SM-SC, SC	A-2	45-70	70-95	70-80	30-60	20-40	25-30	5-10
	1-7	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-15	85-100	60-90	60-80	40-60	30-40	10-15
	7-22	Silty clay loam	CL	A-4, A-6	0	100	90-100	80-100	80-90	30-40	10-15
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---
74*:											
Thedalund family-	0-4	Very gravelly sandy loam.	SM-SC, SC	A-2	10-30	60-80	40-60	20-40	10-30	20-30	5-10
	4-9	Sandy clay loam, clay loam, loam.	SC, CL	A-6	0-15	85-100	60-90	60-80	40-60	30-40	10-15
	9-24	Silty clay loam	CL	A-6	0	100	90-100	80-100	80-90	30-40	10-15
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Badland.											

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
75*:											
Toddler family--	0-7	Silt loam--------	SM-SC, CL, CL-ML	A-2, A-4, A-6	0-10	80-100	75-100	50-100	30-80	25-35	5-15
	7-60	Stratified sandy clay loam to silt loam.	SC, SM-SC, CL, CL-ML	A-2, A-4, A-6	0-10	80-100	75-100	50-100	30-80	25-40	5-20
Ravola family---	0-3	Silt loam--------	CL-ML, CL	A-4, A-6	0	90-100	80-100	70-100	65-95	20-30	5-15
	3-10	Fine sandy loam, silt loam, sandy clay loam.	SC, SM-SC, CL-ML, CL	A-4, A-6	0	90-100	80-100	65-100	40-90	25-30	5-15
	10-60	Silt loam, silty clay loam.	CL	A-6	0	90-100	90-100	85-100	85-90	30-40	10-20
Glenton family--	0-2	Fine sandy loam	SM-SC, SM	A-2, A-4	0-5	80-100	75-100	65-90	30-50	20-30	NP-10
	2-19	Silt loam, loam, very fine sandy loam.	CL-ML, ML	A-4	0-5	80-100	75-100	70-100	50-85	20-30	NP-10
	19-60	Fine sandy loam, coarse sandy loam.	SM-SC, SM	A-2, A-4	0-5	80-100	75-100	50-90	30-50	20-30	NP-10
76*:											
Valleycity------	0-3	Very stony fine sandy loam.	GM-GC	A-2	30-45	50-65	45-60	40-55	20-35	20-25	5-10
	3-12	Very cobbly clay loam, extremely stony sandy clay loam, very stony clay loam.	GC, SC	A-2, A-6	5-65	55-75	50-70	45-65	30-50	25-35	10-20
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Neiber----------	0-3	Silt loam--------	CL-ML	A-4	0-10	85-100	80-100	65-100	50-90	25-35	5-10
	3-8	Silty clay loam, silt loam.	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-100	55-85	25-35	5-15
	8-28	Silty clay loam, clay loam.	CL	A-6	0-10	90-100	85-100	80-100	60-95	30-40	10-15
	28	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
77*-------------- Walknolls family	0-6	Extremely bouldery sandy loam.	GM, GM-GC	A-1, A-2	15-85	30-55	20-45	10-40	5-30	20-30	NP-10
	6-15	Extremely channery sandy loam, very gravelly sandy loam.	GM, GM-GC	A-1, A-2	10-70	30-55	20-45	10-40	5-30	20-30	NP-10
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
78*:											
Windwhistle-----	0-4	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	100	100	90-100	45-60	15-25	NP-10
	4-36	Fine sandy loam, loamy fine sand.	SM, SM-SC	A-2, A-4	0	100	100	90-100	30-50	15-25	NP-10
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 8.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
78*:											
Begay----------	0-4	Fine sandy loam	SM	A-4	0	100	100	70-85	40-50	20-25	NP-5
	4-23	Very fine sandy loam, fine sandy loam, sandy loam.	ML, CL-ML	A-4	0	100	100	80-95	50-65	20-30	NP-10
	23-60	Very fine sandy loam, loamy fine sand, fine sandy loam.	ML, SM	A-4, A-2	0	100	100	75-95	30-60	---	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
1*:											
Abra	0-2	13-20	1.20-1.35	2.0-6.0	0.11-0.18	7.9-9.0	<2	Low	0.32	5	3
	2-7	18-25	1.20-1.45	0.6-2.0	0.11-0.18	7.9-9.0	2-4	Low	0.24		
	7-23	18-25	1.10-1.30	0.6-6.0	0.11-0.18	8.5-9.0	2-4	Low	0.28		
	23-60	15-25	1.10-1.30	0.6-6.0	0.11-0.18	7.9-9.0	<2	Low	0.32		
Barx	0-2	10-20	1.25-1.35	0.6-6.0	0.12-0.16	7.4-8.4	<2	Low	0.43	5	3
	2-13	16-30	1.20-1.30	0.6-2.0	0.12-0.18	7.4-8.4	<2	Moderate	0.32		
	13-33	22-35	1.25-1.40	0.6-2.0	0.16-0.19	7.4-9.0	<2	Moderate	0.24		
	33-60	16-30	1.25-1.40	0.6-2.0	0.11-0.18	7.9-9.0	<2	Moderate	0.28		
2	0-2	10-20	1.25-1.35	0.6-6.0	0.12-0.16	7.4-8.4	<2	Low	0.43	5	3
Barx	2-13	16-30	1.20-1.30	0.6-2.0	0.12-0.18	7.4-8.4	<2	Moderate	0.32		
	13-33	22-35	1.25-1.40	0.6-2.0	0.16-0.19	7.4-9.0	<2	Moderate	0.24		
	33-60	16-30	1.25-1.40	0.6-2.0	0.11-0.18	7.9-9.0	<2	Moderate	0.28		
3	0-2	8-12	1.35-1.50	2.0-6.0	0.11-0.12	7.4-8.4	<2	Low	0.28	5	3
Begay Variant	2-11	13-17	1.25-1.50	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low	0.28		
	11-19	9-14	1.35-1.60	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low	0.28		
	19-26	12-16	1.35-1.50	2.0-6.0	0.08-0.09	7.9-9.0	<2	Low	0.24		
	26-36	7-11	1.35-1.60	2.0-6.0	0.11-0.15	7.9-9.0	<2	Low	0.28		
	36-60	5-12	1.35-1.60	2.0-6.0	0.04-0.09	7.9-9.0	<2	Low	0.10		
4*:											
Begay	0-5	8-15	1.40-1.50	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low	0.43	5	3
	5-26	12-18	1.40-1.50	2.0-6.0	0.13-0.18	7.9-9.0	<2	Low	0.43		
	26-60	5-12	1.40-1.50	2.0-6.0	0.10-0.15	7.9-9.0	<2	Low	0.37		
Sazi	0-4	8-14	1.35-1.50	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low	0.37	3	3
	4-17	10-18	1.35-1.50	2.0-6.0	0.10-0.16	7.4-9.0	<2	Low	0.43		
	17-34	8-16	1.35-1.50	2.0-6.0	0.11-0.16	>7.8	<2	Low	0.37		
	34	---	---	---	---	---	---	---	---		
5*:											
Begay	0-5	8-15	1.40-1.50	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low	0.43	5	3
	5-26	12-18	1.40-1.50	2.0-6.0	0.13-0.18	7.9-9.0	<2	Low	0.43		
	26-60	5-12	1.40-1.50	2.0-6.0	0.10-0.15	7.9-9.0	<2	Low	0.37		
Sazi	0-4	8-14	1.35-1.50	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low	0.37	3	3
	4-17	10-18	1.35-1.50	2.0-6.0	0.10-0.16	7.4-9.0	<2	Low	0.43		
	17-34	8-16	1.35-1.50	2.0-6.0	0.11-0.16	>7.8	<2	Low	0.37		
	34	---	---	---	---	---	---	---	---		
Rizno	0-2	3-18	1.30-1.55	2.0-6.0	0.08-0.12	7.4-8.4	<2	Low	0.32	1	3
	2-8	5-18	1.30-1.55	2.0-6.0	0.08-0.12	7.9-9.0	<2	Low	0.20		
	8	---	---	---	---	---	---	---	---		
6*:											
Begay	0-5	8-15	1.40-1.50	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low	0.43	5	3
	5-26	12-18	1.40-1.50	2.0-6.0	0.13-0.18	7.9-9.0	<2	Low	0.43		
	26-60	5-12	1.40-1.50	2.0-6.0	0.10-0.15	7.9-9.0	<2	Low	0.37		
Rizno	0-2	3-18	1.30-1.55	2.0-6.0	0.08-0.12	7.4-8.4	<2	Low	0.32	1	3
	2-8	5-18	1.30-1.55	2.0-6.0	0.08-0.12	7.9-9.0	<2	Low	0.20		
	8	---	---	---	---	---	---	---	---		
7*:											
Blueflat	0-6	15-23	1.10-1.20	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low	0.32	2	4L
	6-27	35-55	1.30-1.40	0.06-0.2	0.13-0.15	7.9-9.0	4-8	High	0.32		
	27	---	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
7*:											
Blueflat, saline	0-4	15-23	1.10-1.20	0.6-2.0	0.14-0.16	7.9-8.4	2-4	Low----------	0.32	2	4L
	4-16	28-35	1.00-1.10	0.2-0.6	0.16-0.18	7.9-8.4	4-16	Moderate-----	0.43		
	16-28	45-60	1.30-1.40	0.06-0.2	0.03-0.07	7.9-9.0	>16	High---------	0.32		
	28	---	---	---	---	---	---	----------	----		
8*:											
Blueflat---------	0-2	15-23	1.10-1.20	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low----------	0.32	2	4L
	2-35	35-55	1.30-1.40	0.06-0.2	0.13-0.15	7.9-9.0	4-8	High---------	0.32		
	35	---	---	---	---	---	---	----------	----		
Neiber----------	0-3	16-27	1.00-1.10	0.6-2.0	0.14-0.18	7.9-8.4	<2	Low----------	0.49	2	4L
	3-12	27-32	1.15-1.25	0.6-2.0	0.15-0.18	7.9-9.0	<2	Moderate-----	0.43		
	12-32	28-38	1.20-1.30	0.2-0.6	0.16-0.18	7.4-8.4	2-4	Moderate-----	0.43		
	32	---	---	---	---	---	---	----------	----		
9*:											
Bookcliff-------	0-4	10-26	1.20-1.30	0.2-0.6	0.13-0.19	6.6-8.4	<2	Moderate-----	0.17	4	5
	4-12	18-31	1.25-1.40	0.2-0.6	0.12-0.19	6.6-8.4	<2	Moderate-----	0.32		
	12-32	20-33	1.35-1.55	0.2-0.6	0.15-0.19	7.4-8.4	<2	Moderate-----	0.32		
	32-51	24-35	1.35-1.55	0.2-0.6	0.15-0.19	7.9-9.0	<2	Moderate-----	0.32		
	51	---	---	---	---	---	---	----------	----		
Shalako---------	0-3	8-18	1.30-1.45	6.0-20	0.07-0.10	7.4-9.0	<2	Low----------	0.15	1	8
	3-7	10-18	1.30-1.45	2.0-6.0	0.11-0.13	7.9-9.0	<2	Low----------	0.32		
	7-17	7-18	1.30-1.45	2.0-6.0	0.12-0.14	>7.8	<2	Low----------	0.20		
	17	---	---	---	---	---	---	----------	----		
10---------------	0-3	30-40	1.15-1.25	0.2-0.6	0.09-0.11	7.4-8.4	8-16	Moderate-----	0.43	1	6
Chipeta	3-8	35-45	1.15-1.25	0.06-0.2	0.11-0.16	7.4-9.0	8-16	Moderate-----	0.43		
	8	---	---	---	---	---	---	----------	----		
11*:											
Chipeta---------	0-3	30-40	1.15-1.25	0.2-0.6	0.09-0.11	7.4-8.4	8-16	Moderate-----	0.43	1	6
	3-8	35-45	1.15-1.25	0.06-0.2	0.11-0.16	7.4-9.0	8-16	Moderate-----	0.43		
	8	---	---	---	---	---	---	----------	----		
Chipeta, thick--	0-2	30-40	1.15-1.25	0.2-0.6	0.09-0.11	7.4-8.4	8-16	Moderate-----	0.43	1	6
	2-18	35-45	1.15-1.25	0.06-0.2	0.11-0.16	7.4-9.0	8-16	Moderate-----	0.43		
	18	---	---	---	---	---	---	----------	----		
12*:											
Chipeta---------	0-3	30-40	1.15-1.25	0.2-0.6	0.09-0.11	7.4-8.4	8-16	Moderate-----	0.43	1	6
	3-8	35-45	1.15-1.25	0.06-0.2	0.11-0.16	7.4-9.0	8-16	Moderate-----	0.43		
	8	---	---	---	---	---	---	----------	----		
Badland.											
13*---------------	0-5	7-18	1.30-1.50	2.0-6.0	0.05-0.08	7.9-8.4	<2	Low----------	0.17	3	8
Dast family	5-16	7-18	1.30-1.50	2.0-6.0	0.10-0.13	7.9-9.0	<2	Low----------	0.28		
	16-34	7-18	1.20-1.45	2.0-6.0	0.08-0.15	>8.4	<4	Low----------	0.20		
	34	---	---	---	---	---	---	----------	----		
14*:											
Dune land.											
Aneth family-----	0-4	2-12	1.30-1.50	6.0-20	0.05-0.09	7.9-9.0	<2	Low----------	0.20	5	2
	4-12	2-12	1.30-1.50	6.0-20	0.05-0.09	7.9-9.0	<4	Low----------	0.20		
	12-60	2-15	1.30-1.50	6.0-20	0.05-0.09	7.9-9.0	<4	Low----------	0.20		
15*:											
Factory---------	0-4	5-15	1.30-1.45	2.0-6.0	0.10-0.12	7.4-8.4	<2	Low----------	0.28	3	3
	4-22	7-18	1.30-1.45	2.0-6.0	0.08-0.14	7.4-9.0	<2	Low----------	0.24		
	22-34	7-18	1.30-1.45	2.0-6.0	0.08-0.14	8.5-9.0	<4	Low----------	0.20		
	34	---	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
15*:											
Pastern	0-1	7-15	1.30-1.45	2.0-6.0	0.12-0.14	7.9-9.0	<2	Low	0.32	1	3
	1-18	5-18	1.25-1.45	0.6-2.0	0.08-0.14	7.9-9.0	2-4	Low	0.20		
	18	---	---	---	---	---	---	---	---		
16*:											
Firth family	0-14	5-18	1.30-1.50	2.0-6.0	0.09-0.12	6.6-7.8	<2	Low	0.20	5	8
	14-45	5-18	1.20-1.40	0.6-2.0	0.09-0.16	6.6-7.8	<2	Low	0.24		
	45-60	15-30	1.15-1.40	0.2-2.0	0.12-0.18	6.6-7.8	<2	Low	0.28		
Plite family	0-12	4-12	1.30-1.40	2.0-6.0	0.08-0.12	6.6-7.8	<2	Low	0.28	5	3
	12-60	6-18	1.20-1.40	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low	0.28		
17	0-4	6-10	1.20-1.40	2.0-6.0	0.11-0.12	7.9-8.4	<2	Low	0.28	5	3
Flatnose	4-60	6-18	1.20-1.50	2.0-6.0	0.07-0.12	7.4-9.0	<2	Low	0.20		
18*:											
Hanksville family	0-3	14-26	1.10-1.45	0.6-2.0	0.05-0.12	7.4-9.0	<2	Low	0.10	2	8
	3-14	28-39	1.20-1.35	0.2-0.6	0.16-0.18	>6.5	<2	Moderate	0.43		
	14-35	40-50	1.20-1.35	0.06-0.2	0.16-0.18	>6.5	<2	High	0.32		
	35	---	---	---	---	---	---	---	---		
Badland.											
19*:											
Hanksville family	0-3	20-39	1.10-1.35	0.2-0.6	0.10-0.16	7.4-9.0	<2	Moderate	0.20	2	8
	3-12	28-39	1.20-1.35	0.2-0.6	0.16-0.18	>6.5	<2	Moderate	0.43		
	12-27	40-50	1.20-1.35	0.06-0.2	0.16-0.18	>6.5	<2	High	0.32		
	27	---	---	---	---	---	---	---	---		
Shalet	0-3	8-20	1.25-1.40	0.6-2.0	0.12-0.17	7.9-8.4	<2	Low	0.49	1	4L
	3-7	27-35	1.20-1.30	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate	0.37		
	7	---	---	---	---	---	---	---	---		
20*:											
Hostage	0-3	8-18	1.25-1.45	0.6-2.0	0.09-0.10	7.4-8.4	<2	Low	0.20	4	8
	3-24	18-30	1.25-1.45	0.6-2.0	0.09-0.16	7.4-9.0	<2	Moderate	0.24		
	24-32	28-32	1.20-1.45	0.2-0.6	0.16-0.19	7.4-9.0	<2	Moderate	0.24		
	32-42	35-45	1.10-1.30	0.2-0.6	0.14-0.20	7.4-9.0	2-4	High	0.43		
	42	---	---	---	---	---	---	---	---		
Barx	0-2	10-20	1.25-1.35	0.6-6.0	0.12-0.16	7.4-8.4	<2	Low	0.43	5	3
	2-22	16-30	1.20-1.30	0.6-2.0	0.12-0.18	7.4-8.4	<2	Moderate	0.32		
	22-33	22-35	1.25-1.40	0.6-2.0	0.16-0.19	7.4-9.0	<2	Moderate	0.24		
	33-60	16-30	1.25-1.40	0.6-2.0	0.11-0.18	7.9-9.0	<2	Moderate	0.28		
21*:											
Hostage	0-3	8-18	1.25-1.45	0.6-2.0	0.09-0.10	7.4-8.4	<2	Low	0.20	4	8
	3-24	18-30	1.25-1.45	0.6-2.0	0.09-0.16	7.4-9.0	<2	Moderate	0.24		
	24-32	28-32	1.20-1.45	0.2-0.6	0.16-0.19	7.4-9.0	<2	Moderate	0.24		
	32-42	35-45	1.10-1.30	0.2-0.6	0.14-0.20	7.4-9.0	2-4	High	0.43		
	42	---	---	---	---	---	---	---	---		
Chipeta	0-3	30-40	1.15-1.25	0.2-0.6	0.09-0.11	7.4-8.4	8-16	Moderate	0.43	1	6
	3-8	35-45	1.15-1.25	0.06-0.2	0.11-0.16	7.4-9.0	8-16	Moderate	0.43		
	8	---	---	---	---	---	---	---	---		
22*	0-6	11-17	1.20-1.45	0.6-6.0	0.06-0.14	6.6-8.4	<2	Low	0.10	4	8
Hub family	6-31	18-26	1.25-1.50	0.6-6.0	0.08-0.16	6.6-8.4	<2	Low	0.10		
	31-60	15-23	1.25-1.50	0.6-6.0	0.08-0.15	7.4-9.0	<2	Low	0.10		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
23----------	0-4	10-27	1.20-1.30	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low---------	0.55	2	4L
Killpack	4-23	13-33	1.20-1.30	0.2-0.6	0.16-0.18	7.9-9.0	<2	Moderate----	0.49		
	23-38	20-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.49		
	38	---	---	---	---	---	---	----------	----		
24*:											
Killpack--------	0-4	27-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.43	2	4L
	4-23	13-33	1.20-1.30	0.2-0.6	0.16-0.18	7.9-9.0	<2	Moderate----	0.49		
	23-36	20-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.49		
	36	---	---	---	---	---	---	----------	----		
Chipeta---------	0-3	30-40	1.15-1.25	0.2-0.6	0.09-0.11	7.4-8.4	8-16	Moderate----	0.43	1	6
	3-8	35-45	1.15-1.25	0.06-0.2	0.11-0.16	7.4-9.0	8-16	Moderate----	0.43		
	8	---	---	---	---	---	---	----------	----		
25*:											
Killpack--------	0-4	10-27	1.20-1.30	0.6-2.0	0.16-0.18	7.9-9.0	<2	Low---------	0.55	2	4L
	4-23	13-33	1.20-1.30	0.2-0.6	0.16-0.18	7.9-9.0	<2	Moderate----	0.49		
	23-38	20-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.49		
	38	---	---	---	---	---	---	----------	----		
Blueflat--------	0-6	15-23	1.10-1.20	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low---------	0.32	2	4L
	6-27	35-55	1.30-1.40	0.06-0.2	0.13-0.15	7.9-9.0	4-8	High--------	0.32		
	27	---	---	---	---	---	---	----------	----		
26----------	0-2	5-11	1.35-1.40	0.6-2.0	0.11-0.13	7.9-9.0	2-4	Low---------	0.37	1	3
Leeko	2-20	19-27	1.30-1.35	0.2-0.6	0.15-0.18	>8.4	2-4	Moderate----	0.37		
	20-33	16-25	1.25-1.35	0.6-2.0	0.10-0.13	>8.4	4-8	Moderate----	0.37		
	33-60	14-27	1.25-1.30	0.2-0.6	0.13-0.18	>8.4	4-8	Moderate----	0.43		
27*:											
Lockerby--------	0-3	10-20	1.25-1.45	2.0-6.0	0.09-0.11	7.9-9.0	<2	Low---------	0.20	4	6
	3-12	35-40	1.20-1.30	0.2-2.0	0.17-0.19	>7.8	<2	Moderate----	0.43		
	12-28	40-45	1.15-1.25	<0.06	0.17-0.19	>7.8	<2	High--------	0.37		
	28	---	---	---	---	---	---	----------	----		
Shalako---------	0-2	8-18	1.30-1.45	2.0-6.0	0.11-0.14	7.4-9.0	<2	Low---------	0.28	1	3
	2-15	10-18	1.30-1.45	2.0-6.0	0.11-0.13	7.9-9.0	<2	Low---------	0.32		
	15	---	---	---	---	---	---	----------	----		
28----------	0-3	5-17	1.30-1.50	0.6-6.0	0.12-0.17	7.4-8.4	<2	Low---------	0.32	5	4L
Mack	3-16	18-33	1.20-1.40	0.2-2.0	0.16-0.19	7.9-8.4	2-4	Moderate----	0.43		
	16-60	5-19	1.20-1.30	0.6-6.0	0.13-0.17	7.9-9.0	<2	Low---------	0.49		
29*:											
Mack----------	0-3	5-17	1.30-1.50	0.6-6.0	0.12-0.17	7.4-8.4	<2	Low---------	0.32	5	4L
	3-16	18-33	1.20-1.40	0.2-2.0	0.16-0.19	7.9-8.4	2-4	Moderate----	0.43		
	16-60	5-19	1.20-1.30	0.6-6.0	0.13-0.17	7.9-9.0	<2	Low---------	0.49		
Mack, overwash--	0-8	18-24	1.30-1.50	0.6-2.0	0.16-0.19	7.4-8.4	<2	Low---------	0.49	5	4L
	8-26	18-33	1.20-1.40	0.2-2.0	0.16-0.19	7.9-8.4	2-4	Moderate----	0.43		
	26-60	5-19	1.20-1.30	0.6-6.0	0.13-0.17	7.9-9.0	<2	Low---------	0.49		
Sagers----------	0-8	10-27	1.15-1.25	0.6-2.0	0.15-0.18	7.4-9.0	2-8	Low---------	0.49	5	4L
	8-60	27-35	1.15-1.25	0.2-0.6	0.15-0.18	7.9-9.0	2-8	Moderate----	0.43		
30----------	0-10	8-19	1.15-1.35	0.6-6.0	0.11-0.14	7.4-8.4	<2	Low---------	0.32	5	3
Mesa	10-24	19-34	1.10-1.30	0.6-2.0	0.15-0.18	>8.4	<2	Moderate----	0.37		
	24-54	5-20	1.10-1.60	0.2-20	0.06-0.15	>8.4	2-8	Low---------	0.15		
	54-60	10-18	1.15-1.30	0.6-2.0	0.13-0.16	>8.4	2-8	Low---------	0.32		
31*:											
Mesa----------	0-10	8-19	1.15-1.35	0.6-6.0	0.11-0.14	7.4-8.4	<2	Low---------	0.32	5	3
	10-24	19-34	1.10-1.30	0.6-2.0	0.15-0.18	>8.4	<2	Moderate----	0.37		
	24-54	5-20	1.10-1.60	0.2-20	0.06-0.15	>8.4	2-8	Low---------	0.15		
	54-60	10-18	1.15-1.30	0.6-2.0	0.13-0.16	>8.4	2-8	Low---------	0.32		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
31*:											
Chipeta---------	0-3	30-40	1.15-1.25	0.2-0.6	0.09-0.11	7.4-8.4	8-16	Moderate----	0.43	1	6
	3-8	35-45	1.15-1.25	0.06-0.2	0.11-0.16	7.4-9.0	8-16	Moderate----	0.43		
	8	---	---	---	---	---	---	----------	----		
Thedalund family	0-4	18-24	1.35-1.55	0.6-2.0	0.09-0.12	7.9-9.0	<2	Low---------	0.24	3	8
	4-9	26-34	1.30-1.45	0.2-2.0	0.15-0.18	7.9-9.0	<2	Moderate----	0.32		
	9-24	28-38	1.30-1.40	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.32		
	24	---	---	---	---	---	---	----------	----		
32*:											
Mesa----------	0-10	8-19	1.15-1.35	0.6-6.0	0.11-0.14	7.4-8.4	<2	Low---------	0.32	5	3
	10-24	19-34	1.10-1.30	0.6-2.0	0.15-0.18	>8.4	<2	Moderate----	0.37		
	24-54	5-20	1.10-1.60	0.2-20	0.06-0.15	>8.4	2-8	Low---------	0.15		
	54-60	10-18	1.15-1.30	0.6-2.0	0.13-0.16	>8.4	2-8	Low---------	0.32		
Trook----------	0-5	12-18	1.25-1.45	0.2-6.0	0.11-0.12	7.4-8.4	<2	Low---------	0.32	3	3
	5-32	12-18	1.25-1.45	0.6-2.0	0.08-0.15	7.9-9.0	<2	Low---------	0.32		
	32-60	5-18	1.25-1.45	0.6-2.0	0.06-0.10	>7.8	2-4	Low---------	0.24		
33----------	0-7	2-10	1.40-1.50	6.0-20	0.08-0.10	7.9-9.0	<2	Low---------	0.37	5	2
Mido	7-60	3-8	1.40-1.50	6.0-20	0.05-0.09	7.9-9.0	<2	Low---------	0.32		
34*:											
Mido----------	0-7	2-10	1.40-1.50	6.0-20	0.08-0.10	7.9-9.0	<2	Low---------	0.37	5	2
	7-60	3-8	1.40-1.50	6.0-20	0.05-0.09	7.9-9.0	<2	Low---------	0.32		
Sazi----------	0-4	8-14	1.35-1.50	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low---------	0.37	3	3
	4-17	10-18	1.35-1.50	2.0-6.0	0.10-0.16	7.4-9.0	<2	Low---------	0.43		
	17-32	8-16	1.35-1.50	2.0-6.0	0.11-0.16	>7.8	<2	Low---------	0.37		
	32	---	---	---	---	---	---	----------	----		
35*:											
Moenkopie-------	0-2	10-20	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<4	Low---------	0.24	1	3
	2-19	15-20	1.45-1.55	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low---------	0.24		
	19	---	---	---	---	---	---	----------	----		
Rock outcrop.											
36*:											
Moenkopie-------	0-2	10-20	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<4	Low---------	0.24	1	3
	2-19	15-20	1.45-1.55	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low---------	0.24		
	19	---	---	---	---	---	---	----------	----		
Shalako---------	0-1	8-18	1.30-1.45	6.0-20.0	0.07-0.10	7.4-9.0	<2	Low---------	0.15	1	8
	1-4	10-18	1.30-1.45	2.0-6.0	0.11-0.13	7.9-9.0	<2	Low---------	0.32		
	4-10	7-18	1.30-1.45	2.0-6.0	0.12-0.14	>7.8	<2	Low---------	0.20		
	10	---	---	---	---	---	---	----------	----		
Sandoval--------	0-2	20-35	1.15-1.25	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate----	0.43	2	4L
	2-18	20-35	1.15-1.25	0.2-0.6	0.17-0.18	7.9-9.0	<8	Moderate----	0.37		
	18	---	---	---	---	---	---	----------	----		
37----------	0-6	10-20	1.25-1.45	2.0-6.0	0.07-0.09	7.9-9.0	<2	Low---------	0.15	4	8
Moepitz Variant	6-12	6-14	1.40-1.55	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low---------	0.10		
	12-45	4-12	1.35-1.50	2.0-6.0	0.07-0.11	7.9-9.0	<2	Low---------	0.20		
	45	---	---	---	---	---	---	----------	----		
38*:											
Muff family-----	0-3	8-20	1.10-1.35	2.0-6.0	0.05-0.13	7.9-9.0	<4	Low---------	0.15	2	3
	3-23	20-35	1.15-1.35	0.06-0.2	0.13-0.17	8.5-9.0	2-8	Moderate----	0.37		
	23-29	20-35	1.15-1.35	0.06-0.2	0.13-0.17	8.5-9.0	2-8	Moderate----	0.28		
	29	---	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
38*:											
Badland.											
39*:											
Myton family----	0-6	8-18	1.35-1.45	2.0-6.0	0.05-0.10	7.9-9.0	<2	Low----------	0.10	2	8
	6-29	8-18	1.35-1.45	2.0-6.0	0.05-0.10	7.9-9.0	<2	Low----------	0.10		
	29	---	---	---	---	---	---	----------	---		
Rock outcrop.											
40----------	0-3	10-18	1.25-1.35	2.0-6.0	0.10-0.16	7.4-8.4	<2	Low----------	0.28	3	3
Nakai	3-58	10-18	1.30-1.50	2.0-6.0	0.10-0.16	>7.3	<2	Low----------	0.28		
	58	---	---	---	---	---	---	----------	---		
41*:											
Nakai----------	0-3	5-10	1.30-1.45	2.0-6.0	0.08-0.11	7.4-8.4	<2	Low----------	0.28	3	2
	3-51	10-18	1.30-1.50	2.0-6.0	0.10-0.16	>7.3	<2	Low----------	0.28		
	51	---	---	---	---	---	---	----------	---		
Moenkopie-------	0-2	10-20	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<4	Low----------	0.24	1	3
	2-19	15-20	1.45-1.55	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low----------	0.24		
	19	---	---	---	---	---	---	----------	---		
42*:											
Nakai----------	0-3	5-10	1.30-1.45	2.0-6.0	0.08-0.11	7.4-8.4	<2	Low----------	0.28	3	2
	3-51	10-18	1.30-1.50	2.0-6.0	0.10-0.16	>7.3	<2	Low----------	0.28		
	51	---	---	---	---	---	---	----------	---		
Redlands--------	0-8	8-15	1.30-1.45	2.0-6.0	0.11-0.13	7.9-8.4	<2	Low----------	0.37	4	3
	8-14	18-27	1.20-1.30	0.6-2.0	0.12-0.18	7.9-8.4	<2	Low----------	0.20		
	14-59	10-19	1.30-1.45	2.0-6.0	0.09-0.12	7.9-9.0	<2	Low----------	0.37		
	59	---	---	---	---	---	---	----------	---		
43*:											
Nakai----------	0-2	5-10	1.30-1.45	2.0-6.0	0.08-0.11	7.4-8.4	<2	Low----------	0.28	3	2
	2-59	10-18	1.30-1.50	2.0-6.0	0.10-0.16	>7.3	<2	Low----------	0.28		
	59	---	---	---	---	---	---	----------	---		
Sheppard--------	0-60	2-5	1.50-1.60	6.0-20	0.06-0.08	7.4-8.4	<2	Low----------	0.24	5	2
44----------	0-4	10-15	1.35-1.45	2.0-6.0	0.10-0.20	7.9-8.4	<2	Low----------	0.37	1	3
Pennell	4-7	10-25	1.35-1.45	0.6-2.0	0.10-0.20	7.9-9.0	<2	Low----------	0.32		
	7-13	20-27	1.35-1.45	0.6-2.0	0.14-0.18	7.9-9.0	<2	Low----------	0.10		
	13	---	---	---	---	---	---	----------	---		
45*----------	0-20	9-16	1.25-1.45	2.0-6.0	0.08-0.17	6.1-8.4	<2	Low----------	0.28	1	4
Razorba family	20-60	8-18	1.25-1.45	0.6-2.0	0.13-0.18	6.6-8.4	<2	Low----------	0.28		
46*----------	0-2	20-25	1.20-1.40	0.6-2.0	0.13-0.17	7.9-8.4	<2	Low----------	0.24	5	4
Redbank family	2-60	8-18	1.15-1.55	2.0-6.0	0.05-0.17	7.9-9.0	<2	Low----------	0.28		
47*:											
Redbank family--	0-8	8-18	1.20-1.55	2.0-6.0	0.05-0.17	7.4-8.4	<2	Low----------	0.32	5	3
	8-13	8-18	1.15-1.55	2.0-6.0	0.05-0.17	7.9-9.0	<2	Low----------	0.28		
	13-24	5-10	1.15-1.55	6.0-20	0.05-0.17	7.9-9.0	<2	Low----------	0.20		
	24-60	8-18	1.15-1.55	2.0-6.0	0.05-0.17	7.9-9.0	<2	Low----------	0.28		
Flatnose family-	0-5	21-29	1.30-1.45	0.6-2.0	0.14-0.18	7.9-9.0	<2	Low----------	0.24	5	4L
	5-60	8-12	1.35-1.50	2.0-6.0	0.09-0.16	7.9-9.0	<2	Low----------	0.37		
48*:											
Redbank family--	0-2	20-25	1.20-1.40	0.6-2.0	0.13-0.17	7.9-8.4	<2	Low----------	0.24	5	4
	2-60	8-18	1.15-1.55	2.0-6.0	0.05-0.17	7.9-9.0	<2	Low----------	0.28		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
48*:											
Flatnose family-	0-6	8-18	1.20-1.40	2.0-6.0	0.09-0.18	7.9-8.4	<2	Low	0.17	5	3
	6-60	8-18	1.20-1.40	2.0-6.0	0.09-0.18	7.9-9.0	<4	Low	0.24		
49*:											
Reva family	0-2	3-14	1.30-1.50	2.0-6.0	0.03-0.07	7.4-8.4	<2	Low	0.15	1	8
	2-4	7-16	1.30-1.50	2.0-6.0	0.11-0.15	7.4-8.4	<2	Low	0.20		
	4-8	7-16	1.20-1.45	2.0-6.0	0.04-0.07	7.4-8.4	<2	Low	0.15		
	8	---	---	---	---	---	---	---	---		
Falcon family	0-2	7-11	1.20-1.40	0.6-6.0	0.03-0.05	7.4-7.8	<2	Low	0.17	1	8
	2-19	9-25	1.15-1.40	0.6-6.0	0.11-0.16	7.4-8.4	<2	Low	0.20		
	19	---	---	---	---	---	---	---	---		
Rock outcrop.											
50*.											
Riverwash											
51*:											
Rizno	0-2	3-18	1.30-1.55	2.0-6.0	0.08-0.12	7.4-8.4	<2	Low	0.32	1	3
	2-8	5-18	1.30-1.55	2.0-6.0	0.08-0.12	7.9-9.0	<2	Low	0.20		
	8	---	---	---	---	---	---	---	---		
Begay	0-5	8-15	1.40-1.50	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low	0.43	5	3
	5-26	12-18	1.40-1.50	2.0-6.0	0.13-0.18	7.9-9.0	<2	Low	0.43		
	26-60	5-12	1.40-1.50	2.0-6.0	0.10-0.15	7.9-9.0	<2	Low	0.37		
52*:											
Rizno	0-2	3-18	1.30-1.55	2.0-6.0	0.08-0.12	7.4-8.4	<2	Low	0.32	1	3
	2-8	5-18	1.30-1.55	2.0-6.0	0.08-0.12	7.9-9.0	<2	Low	0.20		
	8	---	---	---	---	---	---	---	---		
Rock outcrop.											
53*.											
Rock outcrop											
54*:											
Rock outcrop.											
Arches	0-2	3-8	1.40-1.50	6.0-20	0.08-0.10	7.4-8.4	<2	Low	0.28	1	2
	2-16	3-8	1.40-1.50	6.0-20	0.08-0.10	7.4-9.0	<2	Low	0.28		
	16	---	---	---	---	---	---	---	---		
Mido	0-7	2-10	1.40-1.50	6.0-20	0.08-0.10	7.9-9.0	<2	Low	0.37	5	2
	7-60	3-8	1.40-1.50	6.0-20	0.05-0.09	7.9-9.0	<2	Low	0.32		
55*:											
Rock outcrop.											
Moenkopie	0-2	10-20	1.45-1.55	2.0-6.0	0.11-0.13	7.9-8.4	<4	Low	0.24	1	3
	2-19	15-20	1.45-1.55	2.0-6.0	0.11-0.13	7.4-8.4	<4	Low	0.24		
	19	---	---	---	---	---	---	---	---		
56	0-8	10-27	1.15-1.25	0.6-2.0	0.15-0.18	7.4-9.0	2-8	Low	0.49	5	4L
Sagers	8-60	27-35	1.15-1.25	0.2-0.6	0.15-0.18	7.9-9.0	2-8	Moderate	0.43		
57*:											
Sandoval	0-2	20-35	1.15-1.25	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate	0.43	2	4L
	2-18	20-35	1.15-1.25	0.2-0.6	0.17-0.18	7.9-9.0	<8	Moderate	0.37		
	18	---	---	---	---	---	---	---	---		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
57*:											
Strych----------	0-6	17-19	1.35-1.45	2.0-6.0	0.11-0.12	7.4-8.4	<2	Low----------	0.32	2	3
	6-11	16-18	1.35-1.50	2.0-6.0	0.10-0.15	7.9-9.0	<2	Low----------	0.28		
	11-48	14-18	1.45-1.60	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low----------	0.20		
	48-60	14-18	1.40-1.65	6.0-20	0.09-0.16	7.9-9.0	<2	Low----------	0.17		
58*:											
Sandoval--------	0-2	20-35	1.15-1.25	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate-----	0.43	2	4L
	2-18	20-35	1.15-1.25	0.2-0.6	0.17-0.18	7.9-9.0	<8	Moderate-----	0.37		
	18	---	---	---	---	---	---	----------	----		
Killpack--------	0-4	27-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate-----	0.43	2	4L
	4-23	13-33	1.20-1.30	0.2-0.6	0.16-0.18	7.9-9.0	<2	Moderate-----	0.49		
	23-36	20-35	1.20-1.30	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate-----	0.49		
	36	---	---	---	---	---	---	----------	----		
59*:											
Sandoval--------	0-2	20-35	1.15-1.25	0.2-0.6	0.15-0.18	7.9-8.4	<2	Moderate-----	0.43	2	4L
	2-18	20-35	1.15-1.25	0.2-0.6	0.17-0.18	7.9-9.0	<8	Moderate-----	0.37		
	18	---	---	---	---	---	---	----------	----		
Thedalund family	0-2	18-24	1.35-1.55	0.6-2.0	0.09-0.12	7.9-9.0	<2	Low----------	0.24	3	8
	2-5	26-34	1.30-1.45	0.2-2.0	0.15-0.18	7.9-9.0	<2	Moderate-----	0.32		
	5-27	28-38	1.30-1.40	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate-----	0.37		
	27	---	---	---	---	---	---	----------	----		
60----------	0-1	8-14	1.35-1.50	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low----------	0.37	3	3
Sazi	1-5	10-18	1.35-1.50	2.0-6.0	0.10-0.16	7.4-9.0	<2	Low----------	0.43		
	5-27	8-16	1.35-1.50	2.0-6.0	0.11-0.16	>7.8	<2	Low----------	0.37		
	27	---	---	---	---	---	---	----------	----		
61*:											
Sazi----------	0-1	8-14	1.35-1.50	2.0-6.0	0.12-0.16	7.4-8.4	<2	Low----------	0.37	3	3
	1-5	10-18	1.35-1.50	2.0-6.0	0.10-0.16	7.4-9.0	<2	Low----------	0.43		
	5-27	8-16	1.35-1.50	2.0-6.0	0.11-0.16	>7.8	<2	Low----------	0.37		
	27	---	---	---	---	---	---	----------	----		
Shalako---------	0-1	8-18	1.30-1.45	6.0-20.0	0.07-0.10	7.4-9.0	<2	Low----------	0.15	1	8
	1-4	10-18	1.30-1.45	2.0-6.0	0.11-0.13	7.9-9.0	<2	Low----------	0.32		
	4-14	7-18	1.30-1.45	2.0-6.0	0.12-0.14	>7.8	<2	Low----------	0.20		
	14	---	---	---	---	---	---	----------	----		
Mido----------	0-7	2-10	1.40-1.50	6.0-20	0.08-0.10	7.9-9.0	<2	Low----------	0.37	5	2
	7-60	3-8	1.40-1.50	6.0-20	0.05-0.09	7.9-9.0	<2	Low----------	0.32		
62----------	0-1	8-18	1.30-1.45	6.0-20.0	0.07-0.10	7.4-9.0	<2	Low----------	0.15	1	8
Shalako	1-4	10-18	1.30-1.45	2.0-6.0	0.11-0.13	7.9-9.0	<2	Low----------	0.32		
	4-10	7-18	1.30-1.45	2.0-6.0	0.12-0.14	>7.8	<2	Low----------	0.20		
	10	---	---	---	---	---	---	----------	----		
63----------	0-2	8-18	1.30-1.45	2.0-6.0	0.11-0.14	7.4-9.0	<2	Low----------	0.28	1	3
Shalako	2-11	10-18	1.30-1.45	2.0-6.0	0.11-0.13	7.9-9.0	<2	Low----------	0.32		
	11	---	---	---	---	---	---	----------	----		
64----------	0-3	8-20	1.25-1.40	0.6-2.0	0.12-0.17	7.9-8.4	<2	Low----------	0.49	1	4L
Shalet	3-7	27-35	1.20-1.30	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate-----	0.37		
	7	---	---	---	---	---	---	----------	----		
65*:											
Shalet----------	0-3	8-20	1.25-1.40	0.6-2.0	0.12-0.17	7.9-8.4	<2	Low----------	0.49	1	4L
	3-7	27-35	1.20-1.30	0.2-0.6	0.14-0.18	7.9-9.0	<2	Moderate-----	0.37		
	7	---	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
65*:											
Nakai----------	0-3	10-18	1.25-1.35	2.0-6.0	0.10-0.16	7.4-8.4	<2	Low---------	0.28	3	3
	3-57	10-18	1.30-1.50	2.0-6.0	0.10-0.16	>7.3	<2	Low---------	0.28		
	57	---	---	---	---	---	---	----------	----		
66----------	0-1	2-5	1.50-1.60	6.0-20	0.05-0.07	7.4-8.4	<2	Low---------	0.20	5	1
Sheppard	1-60	3-8	1.50-1.60	6.0-20	0.06-0.08	7.4-9.0	<2	Low---------	0.20		
67----------	0-21	8-16	1.30-1.45	2.0-6.0	0.10-0.13	6.6-7.8	<2	Low---------	0.15	5	3
Skylick	21-30	15-27	1.30-1.50	0.2-2.0	0.10-0.17	6.6-7.8	<2	Low---------	0.24		
	30-60	20-35	1.30-1.50	0.2-0.6	0.10-0.17	7.4-7.8	<2	Moderate----	0.28		
68*.											
Slickens											
69----------	0-6	17-19	1.35-1.45	2.0-6.0	0.11-0.12	7.4-8.4	<2	Low---------	0.32	2	3
Strych	6-11	16-18	1.35-1.50	2.0-6.0	0.10-0.15	7.9-9.0	<2	Low---------	0.28		
	11-48	14-18	1.45-1.60	2.0-6.0	0.06-0.11	7.9-9.0	<2	Low---------	0.20		
	48-60	14-18	1.40-1.65	6.0-20	0.09-0.16	7.9-9.0	<2	Low---------	0.17		
70*:											
Sula family-----	0-3	7-15	1.20-1.45	0.6-2.0	0.07-0.17	6.6-8.4	<2	Low---------	0.32	2	4
	3-12	9-18	1.20-1.45	0.6-2.0	0.06-0.17	6.6-8.4	<2	Low---------	0.20		
	12-22	7-18	1.10-1.45	0.6-2.0	0.06-0.17	6.6-9.0	<2	Low---------	0.32		
	22	---	---	---	---	---	---	----------	----		
Razorba family--	0-8	9-16	1.25-1.45	2.0-6.0	0.08-0.17	6.1-8.4	<2	Low---------	0.28	1	4
	8-60	8-18	1.25-1.45	0.6-2.0	0.13-0.18	6.6-8.4	<2	Low---------	0.28		
71*----------	0-1	18-24	1.35-1.55	0.6-2.0	0.09-0.12	7.9-9.0	<2	Low---------	0.24	3	8
Thedalund family	1-10	26-34	1.30-1.45	0.2-2.0	0.15-0.18	7.9-9.0	<2	Moderate----	0.32		
	10-22	28-38	1.30-1.40	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.37		
	22	---	---	---	---	---	---	----------	----		
72*----------	0-2	16-24	1.35-1.55	0.6-2.0	0.08-0.10	7.9-9.0	<2	Low---------	0.17	3	8
Thedalund family	2-13	26-34	1.30-1.45	0.2-2.0	0.15-0.18	7.9-9.0	<2	Moderate----	0.32		
	13-36	28-38	1.30-1.40	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.37		
	36	---	---	---	---	---	---	----------	----		
73*----------	0-1	18-24	1.35-1.55	0.6-2.0	0.09-0.12	7.9-9.0	<2	Low---------	0.24	3	8
Thedalund family	1-7	26-34	1.30-1.45	0.2-2.0	0.15-0.18	7.9-9.0	<2	Moderate----	0.32		
	7-22	28-38	1.30-1.40	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.37		
	22	---	---	---	---	---	---	----------	----		
74*:											
Thedalund family	0-4	14-20	1.35-1.55	0.6-6.0	0.08-0.11	7.9-9.0	<2	Low---------	0.24	3	8
	4-9	26-34	1.30-1.45	0.2-2.0	0.15-0.18	7.9-9.0	<2	Moderate----	0.32		
	9-24	28-38	1.30-1.40	0.2-0.6	0.15-0.18	7.9-9.0	<2	Moderate----	0.37		
	24	---	---	---	---	---	---	----------	----		
Rock outcrop.											
Badland.											
75*:											
Toddler family--	0-7	18-27	1.10-1.30	0.6-2.0	0.10-0.18	7.9-9.0	2-8	Moderate----	0.32	5	4L
	7-60	18-35	1.25-1.45	0.6-2.0	0.10-0.18	7.9-9.0	2-8	Moderate----	0.32		
Ravola family---	0-3	14-25	1.15-1.30	0.2-2.0	0.15-0.18	7.9-9.0	2-8	Low---------	0.43	5	4L
	3-10	15-25	1.15-1.50	0.2-6.0	0.10-0.18	7.9-9.0	4-16	Low---------	0.37		
	10-60	20-35	1.10-1.30	0.2-0.6	0.15-0.18	7.9-9.0	4-16	Moderate----	0.43		
Glenton family--	0-2	5-18	1.30-1.40	2.0-6.0	0.08-0.12	7.9-8.4	<8	Low---------	0.24	5	3
	2-19	5-18	1.30-1.40	2.0-6.0	0.13-0.18	>7.8	<8	Low---------	0.37		
	19-60	5-18	1.30-1.40	2.0-6.0	0.08-0.12	>7.8	<8	Low---------	0.20		

See footnote at end of table.

TABLE 9.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
									K	T	
	In	Pct	G/cc	In/hr	In/in	pH	mmhos/cm				
76*:											
Valleycity------	0-3	12-20	1.10-1.15	0.6-2.0	0.07-0.09	7.4-8.4	<2	Low----------	0.05	1	8
	3-12	25-35	1.00-1.25	0.6-2.0	0.08-0.12	7.4-9.0	<2	Low----------	0.02		
	12	---	---	---	---	---	---	----------	----		
Neiber----------	0-3	16-27	1.00-1.10	0.6-2.0	0.14-0.18	7.9-8.4	<2	Low----------	0.49	2	4L
	3-8	27-32	1.15-1.25	0.6-2.0	0.15-0.18	7.9-9.0	<2	Moderate-----	0.43		
	8-28	28-38	1.20-1.30	0.2-0.6	0.16-0.18	7.4-8.4	2-4	Moderate-----	0.43		
	28	---	---	---	---	---	---	----------	----		
Rock outcrop.											
77*----------	0-6	8-20	1.20-1.45	2.0-6.0	0.05-0.10	7.4-8.4	<2	Low----------	0.15	1	8
Walknolls family	6-15	8-20	1.25-1.50	2.0-6.0	0.05-0.10	7.4-8.4	<2	Low----------	0.15		
	15	---	---	---	---	---	---	----------	----		
78*:											
Windwhistle-----	0-4	8-13	1.40-1.50	2.0-6.0	0.14-0.16	7.4-8.4	<2	Low----------	0.49	3	3
	4-36	8-14	1.40-1.55	2.0-20	0.09-0.12	7.9-9.0	<2	Low----------	0.43		
	36	---	---	---	---	---	---	----------	----		
Begay----------	0-4	8-15	1.40-1.50	2.0-6.0	0.09-0.14	7.9-8.4	<2	Low----------	0.43	5	3
	4-23	12-18	1.40-1.50	2.0-6.0	0.13-0.18	7.9-9.0	<2	Low----------	0.43		
	23-60	5-12	1.40-1.50	2.0-6.0	0.10-0.15	7.9-9.0	<2	Low----------	0.37		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--SOIL AND WATER FEATURES

[The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
		In		In				
1*:								
Abra	B	>60	---	---	---	Moderate	High	Moderate.
Barx	B	>60	---	---	---	Moderate	High	Low.
2---- Barx	B	>60	---	---	---	Moderate	High	Low.
3---- Begay Variant	B	>60	---	---	---	Moderate	High	Low.
4*:								
Begay	B	>60	---	---	---	Low	High	Moderate.
Sazi	C	20-40	Hard	---	---	Low	High	Moderate.
5*:								
Begay	B	>60	---	---	---	Low	High	Moderate.
Sazi	C	20-40	Hard	---	---	Low	High	Moderate.
Rizno	D	4-20	Hard	---	---	Low	High	Moderate.
6*:								
Begay	B	>60	---	---	---	Low	High	Moderate.
Rizno	D	4-20	Hard	---	---	Low	High	Moderate.
7*:								
Blueflat	C	20-40	Soft	---	---	Low	High	High.
Blueflat, saline-	C	20-40	Soft	---	---	Low	High	High.
8*:								
Blueflat	C	20-40	Soft	---	---	Low	High	High.
Neiber	C	20-40	Soft	---	---	Low	High	Moderate.
9*:								
Bookcliff	B	40-60	Hard	---	---	Moderate	High	Moderate.
Shalako	D	10-20	Hard	---	---	Low	High	Moderate.
10---- Chipeta	D	5-20	Soft	---	---	Low	High	High.
11*:								
Chipeta	D	5-20	Soft	---	---	Low	High	High.
Chipeta, thick---	D	5-20	Soft	---	---	Low	High	High.
12*:								
Chipeta	D	5-20	Soft	---	---	Low	High	High.
Badland.								
13*---- Dast family	B	20-40	Hard	---	---	Moderate	High	Moderate.

See footnote at end of table.

TABLE 10.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
		In		In				
14*: Dune land.								
Aneth family-----	A	>60	---	---	---	Low----------	High--------	Moderate.
15*:								
Factory----------	C	>60	---	20-40	Thick	Moderate-----	High--------	Moderate.
Pastern----------	D	>60	---	7-20	Thick	Low----------	High--------	Moderate.
16*:								
Firth family-----	D	>60	---	---	---	High---------	Moderate----	Low.
Plite family-----	B	>60	---	---	---	Moderate-----	High--------	Moderate.
17---------- Flatnose	B	>60	---	---	---	Low----------	High--------	Moderate.
18*:								
Hanksville family	C	20-40	Soft	---	---	Low----------	High--------	High.
Badland.								
19*:								
Hanksville family	C	20-40	Soft	---	---	Low----------	High--------	High.
Shalet-----------	D	5-20	Soft	---	---	Low----------	High--------	Moderate.
20*:								
Hostage----------	B	40-60	Soft	---	---	Low----------	High--------	High.
Barx-------------	B	>60	---	---	---	Moderate-----	High--------	Low.
21*:								
Hostage----------	B	40-60	Soft	---	---	Low----------	High--------	High.
Chipeta----------	D	5-20	Soft	---	---	Low----------	High--------	High.
22*---------- Hub family	B	>60	---	---	---	Low----------	High--------	Low.
23---------- Killpack	C	20-40	Soft	---	---	Low----------	High--------	High.
24*:								
Killpack---------	C	20-40	Soft	---	---	Low----------	High--------	High.
Chipeta----------	D	5-20	Soft	---	---	Low----------	High--------	High.
25*:								
Killpack---------	C	20-40	Soft	---	---	Low----------	High--------	High.
Blueflat---------	C	20-40	Soft	---	---	Low----------	High--------	High.
26---------- Leeko	B	>60	---	---	---	Low----------	High--------	Moderate.
27*:								
Lockerby---------	D	20-40	Soft	---	---	Moderate-----	High--------	High.
Shalako----------	D	10-20	Hard	---	---	Low----------	High--------	Moderate.
28---------- Mack	C	>60	---	---	---	Low----------	High--------	Moderate.

See footnote at end of table.

TABLE 10.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
		In		In				
29*:								
Mack	C	>60	---	---	---	Low	High	Moderate.
Mack, overwash	C	>60	---	---	---	Low	High	Moderate.
Sagers	B	>60	---	---	---	Low	High	Moderate.
30--Mesa	B	>60	---	---	---	Low	High	Moderate.
31*:								
Mesa	B	>60	---	---	---	Low	High	Moderate.
Chipeta	D	5-20	Soft	---	---	Low	High	High.
Thedalund family	C	20-40	Soft	---	---	Moderate	High	Moderate.
32*:								
Mesa	B	>60	---	---	---	Low	High	Moderate.
Trook	B	>60	---	---	---	Low	High	Moderate.
33--Mido	A	>60	---	---	---	Low	High	Moderate.
34*:								
Mido	A	>60	---	---	---	Low	High	Moderate.
Sazi	C	20-40	Hard	---	---	Low	High	Moderate.
35*:								
Moenkopie	D	5-20	Hard	---	---	Low	High	Low.
Rock outcrop.								
36*:								
Moenkopie	D	5-20	Hard	---	---	Low	High	Low.
Shalako	D	10-20	Hard	---	---	Low	High	Moderate.
Sandoval	D	10-20	Soft	---	---	Low	High	Moderate.
37--Moepitz Variant	B	40-60	Hard	---	---	Low	High	High.
38*:								
Muff family	C	20-40	Soft	---	---	Low	High	Moderate.
Badland.								
39*:								
Myton family	C	20-40	Hard	---	---	Low	High	Moderate.
Rock outcrop.								
40--Nakai	B	40-60	Hard	---	---	Low	High	Moderate.
41*:								
Nakai	B	40-60	Hard	---	---	Low	High	Moderate.
Moenkopie	D	5-20	Hard	---	---	Low	High	Low.
42*:								
Nakai	B	40-60	Hard	---	---	Low	High	Moderate.

See footnote at end of table.

TABLE 10.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
		In		In				
42*:								
Redlands	B	40-60	Hard	---	---	Low	High	Moderate.
43*:								
Nakai	B	40-60	Hard	---	---	Low	High	Moderate.
Sheppard	A	>60	---	---	---	Low	High	Moderate.
44---- Pennell	D	10-20	Hard	---	---	Low	High	Moderate.
45*---- Razorba family	B	>60	---	---	---	Moderate	Moderate	Low.
46*---- Redbank family	B	>60	---	---	---	Low	High	Moderate.
47*:								
Redbank family	B	>60	---	---	---	Low	High	Moderate.
Flatnose family	C	>60	---	---	---	Moderate	High	Moderate.
48*:								
Redbank family	B	>60	---	---	---	Low	High	Moderate.
Flatnose family	B	>60	---	---	---	Moderate	High	Moderate.
49*:								
Reva family	D	5-20	Hard	---	---	Moderate	Moderate	Low.
Falcon family	D	10-20	Hard	---	---	Low	High	Low.
Rock outcrop.								
50*. Riverwash								
51*:								
Rizno	D	4-20	Hard	---	---	Low	High	Moderate.
Begay	B	>60	---	---	---	Low	High	Moderate.
52*:								
Rizno	D	4-20	Hard	---	---	Low	High	Moderate.
Rock outcrop.								
53*. Rock outcrop								
54*:								
Rock outcrop.								
Arches	D	10-20	Hard	---	---	Low	High	Low.
Mido	A	>60	---	---	---	Low	High	Moderate.
55*:								
Rock outcrop.								
Moenkopie	D	5-20	Hard	---	---	Low	High	Low.

See footnote at end of table

TABLE 10.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
		In		In				
56---------- Sagers	B	>60	---	---	---	Low----------	High--------	Moderate.
57*: Sandoval---------	D	10-20	Soft	---	---	Low----------	High--------	Moderate.
Strych----------	B	>60	---	---	---	Moderate-----	High--------	Moderate.
58*: Sandoval---------	D	10-20	Soft	---	---	Low----------	High--------	Moderate.
Killpack---------	C	20-40	Soft	---	---	Low----------	High--------	High.
59*: Sandoval---------	D	10-20	Soft	---	---	Low----------	High--------	Moderate.
Thedalund family-	C	20-40	Soft	---	---	Moderate-----	High--------	Moderate.
60---------- Sazi	C	20-40	Hard	---	---	Low----------	High--------	Moderate.
61*: Sazi----------	C	20-40	Hard	---	---	Low----------	High--------	Moderate.
Shalako----------	D	10-20	Hard	---	---	Low----------	High--------	Moderate.
Mido----------	A	>60	---	---	---	Low----------	High--------	Moderate.
62, 63---------- Shalako	D	10-20	Hard	---	---	Low----------	High--------	Moderate.
64---------- Shalet	D	5-20	Soft	---	---	Low----------	High--------	Moderate.
65*: Shalet----------	D	5-20	Soft	---	---	Low----------	High--------	Moderate.
Nakai----------	B	40-60	Hard	---	---	Low----------	High--------	Moderate.
66---------- Sheppard	A	>60	---	---	---	Low----------	High--------	Moderate.
67---------- Skylick	B	>60	---	---	---	Moderate-----	Moderate----	Low.
68*. Slickens								
69---------- Strych	B	>60	---	---	---	Moderate-----	High--------	Moderate.
70*: Sula family------	B	20-40	Hard	---	---	Moderate-----	High--------	Low.
Razorba family---	B	>60	---	---	---	Moderate-----	Moderate----	Low.
71*, 72*, 73*----- Thedalund family	C	20-40	Soft	---	---	Moderate-----	High--------	Moderate.
74*: Thedalund family-	C	20-40	Soft	---	---	Moderate-----	High--------	Moderate.
Rock outcrop.								
Badland.								

See footnote at end of table.

TABLE 10.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Depth	Hardness	Depth	Thickness		Uncoated steel	Concrete
		In		In				
75*:								
Toddler family---	B	>60	---	---	---	Low----------	High--------	Moderate.
Ravola family----	B	>60	---	---	---	Low----------	High--------	Moderate.
Glenton family---	B	>60	---	---	---	Low----------	High--------	Moderate.
76*:								
Valleycity-------	D	10-20	Hard	---	---	Low----------	High--------	Low.
Neiber-----------	C	20-40	Soft	---	---	Low----------	High--------	Moderate.
Rock outcrop.								
77*---------- Walknolls family	D	5-20	Hard	---	---	Low----------	High--------	Low.
78*:								
Windwhistle------	C	20-40	Hard	---	---	Moderate-----	High--------	Moderate.
Begay------------	B	>60	---	---	---	Low----------	High--------	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Abra	Fine-loamy, mixed, mesic Ustollic Calciorthids
Aneth family	Sandy, mixed (calcareous), mesic Typic Torriorthents
Arches	Mixed, mesic Lithic Torripsamments
Barx	Fine-loamy, mixed, mesic Ustollic Haplargids
Begay	Coarse-loamy, mixed, mesic Ustollic Camborthids
Begay Variant	Coarse-loamy, mixed, mesic Ustollic Camborthids
Blueflat	Fine, mixed, mesic Cambic Gypsiorthids
Bookcliff	Fine-loamy, mixed Typic Argiborolls
Chipeta	Clayey, mixed (calcareous), mesic, shallow Typic Torriorthents
Dast family	Coarse-loamy, mixed (calcareous), frigid Typic Ustorthents
Factory	Coarse-loamy, carbonatic, mesic Ustollic Paleorthids
Falcon family	Loamy, mixed Lithic Haploborolls
Firth family	Coarse-loamy, mixed Aquic Haploborolls
Flatnose	Coarse-loamy, mixed (calcareous), mesic Typic Ustifluvents
Flatnose family	Coarse-loamy, mixed (calcareous), mesic Typic Ustifluvents
Glenton family	Coarse-loamy, mixed (calcareous), mesic Typic Torrifluvents
Hanksville family	Fine, mixed (calcareous), mesic Typic Torriorthents
Hostage	Fine-loamy, mixed (calcareous), mesic Typic Torriorthents
Hub family	Fine-loamy, mixed Mollic Cryoboralfs
Killpack	Fine-silty, mixed (calcareous), mesic Typic Torriorthents
Leeko	Fine-loamy, mixed, mesic Typic Natrargids
Lockerby	Fine, montmorillonitic, mesic Ustertic Camborthids
Mack	Fine-loamy, mixed, mesic Typic Haplargids
Mesa	Fine-loamy, mixed, mesic Typic Haplargids
Mido	Mixed, mesic Ustic Torripsamments
Moenkopie	Loamy, mixed (calcareous), mesic Lithic Torriorthents
Moepitz Variant	Coarse-loamy, mixed (calcareous), mesic Typic Torriorthents
Muff family	Fine-loamy, mixed, mesic Typic Natrargids
Myton family	Loamy-skeletal, mixed (calcareous), mesic Typic Torriorthents
Nakai	Coarse-loamy, mixed, mesic Typic Calciorthids
Neiber	Fine-loamy, mixed, mesic Typic Haplargids
Pastern	Loamy, mixed, mesic, shallow Ustollic Paleorthids
Pennell	Loamy, mixed, mesic Lithic Calciorthids
Plite family	Coarse-loamy, mixed Cumulic Haploborolls
Ravola family	Fine-silty, mixed (calcareous), mesic Typic Torrifluvents
Razorba family	Coarse-loamy, mixed Pachic Cryoborolls
Redbank family	Coarse-loamy, mixed (calcareous), mesic Ustic Torrifluvents
Redlands	Fine-loamy, mixed, mesic Typic Haplargids
Reva family	Loamy-skeletal, mixed (calcareous), frigid Lithic Ustorthents
Rizno	Loamy, mixed (calcareous), mesic Lithic Ustic Torriorthents
Sagers	Fine-silty, mixed (calcareous), mesic Typic Torriorthents
Sandoval	Loamy, mixed (calcareous), mesic, shallow Ustic Torriorthents
Sazi	Coarse-loamy, mixed, mesic Ustollic Calciorthids
Shalako	Loamy, mixed, mesic Lithic Ustollic Calciorthids
Shalet	Loamy, mixed (calcareous), mesic, shallow Typic Torriorthents
Sheppard	Mixed, mesic Typic Torripsamments
Skylick	Fine-loamy, mixed Cryic Pachic Paleborolls
Strych	Loamy-skeletal, mixed, mesic Ustollic Calciorthids
Sula family	Coarse-loamy, mixed Typic Cryoborolls
Thedalund	Fine-loamy, mixed (calcareous) mesic Ustic Torriorthents
Toddler family	Fine-loamy, mixed (calcareous), mesic Typic Torrifluvents
Trook	Coarse-loamy, mixed, mesic Typic Calciorthids
Valleycity	Loamy-skeletal, mixed, mesic Lithic Haplargids
Walknolls family	Loamy-skeletal, mixed (calcareous), mesic Lithic Torriorthents
Windwhistle	Coarse-loamy, mixed, mesic Ustollic Haplargids

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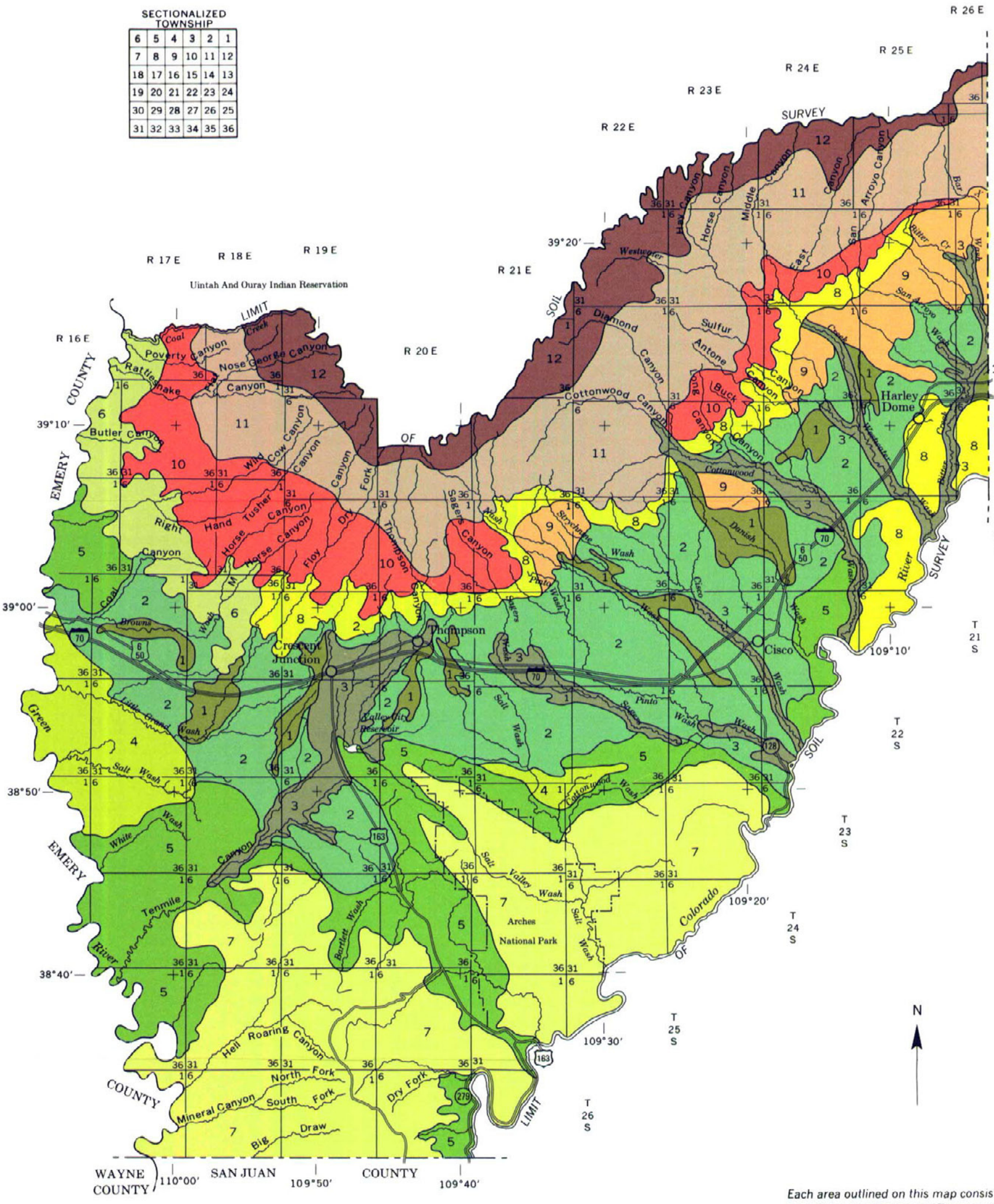
SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

DOMINANTLY WELL DRAINED, NEARLY LEVEL TO STEEP SOILS IN AN ARID CLIMATIC ZONE

1 — Mesa-Mack-Thedalund family: Moderately deep and very deep, well drained, gently sloping and steep soils; on alluvial fan pediments

2 — Chipeta-Killpack-Blueflat: Very shallow to moderately deep, well drained, nearly level to steep soils; on shale plains and pediments

3 — Toddler-Ravola-Glenton families: Very deep, well drained, nearly level and gently sloping soils; on alluvial fans and flood plains and along drainageways

4 — Badland-Rock outcrop-Muff family: Badland, Rock outcrop, and moderately deep, well drained, nearly level to steep soils; on hills

5 — Rock outcrop-Nakai-Moenkopie: Rock outcrop, and shallow and deep, well drained, nearly level to moderately steep soils; on cuestas, structural benches, valley floors, and mesas

6 — Hanksville family-Walknolls family-Hostage: Very shallow to deep, well drained, gently sloping to very steep soils; on cuestas, structural benches, alluvial fans, and canyon escarpments

DOMINANTLY WELL DRAINED, GENTLY SLOPING TO VERY STEEP SOILS IN A SEMI-ARID CLIMATIC ZONE

7 — Rock outcrop-Rizno-Begay: Rock outcrop, and very shallow, shallow, and very deep, well drained, gently sloping to moderately steep soils; on structural benches and cuestas

8 — Thedalund family-Hanksville family-Shalako: Shallow and moderately deep, well drained, gently sloping to very steep soils; on structural benches, mesas, cuestas, and escarpments

9 — Barx-Strych-Sandoval: Shallow and very deep, nearly level to gently sloping soils; on alluvial fans and shale pediments

DOMINANTLY WELL DRAINED, STEEP AND VERY STEEP SOILS IN SEMI-ARID AND DRY SUBHUMID CLIMATIC ZONES

10 — Theduland family-Dast family: Moderately deep and deep, well drained, steep and very steep soils; on canyon escarpments and mountainsides

DOMINANTLY WELL DRAINED, GENTLY SLOPING TO VERY STEEP SOILS IN A SUBHUMID CLIMATIC ZONE

11 — Shalako-Dast family-Reva family: Shallow to deep, well drained, nearly level to very steep soils; on benches and mountainsides

12 — Razorba family-Sula family-Reva family: Very shallow to very deep, well drained, steep and very steep soils; on mountainsides

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SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
UTAH STATE UNIVERSITY
UTAH AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

GRAND COUNTY, UTAH
CENTRAL PART

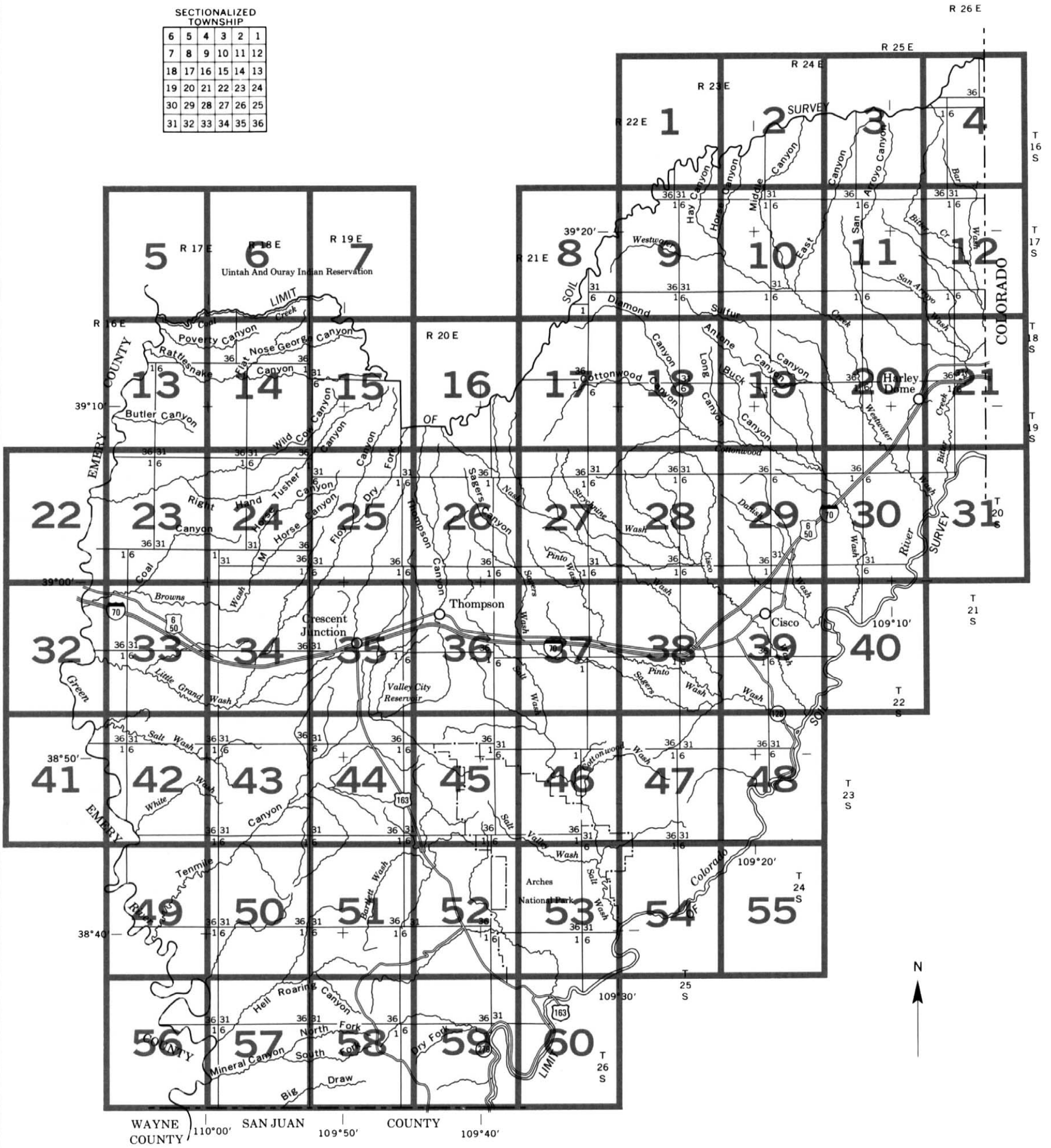
Scale 1:443,520

1 0 1 2 3 4 5 6 7 Miles

0 7 14 Km

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36



INDEX TO MAP SHEETS

GRAND COUNTY, UTAH
CENTRAL PART

Scale 1:443,520

1 0 1 2 3 4 5 6 7 Miles

0 7 14 Km

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GRAND COUNTY, UTAH CENTRAL PART

U.S. DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
UTAH STATE UNIVERSITY
UTAH AGRICULTURAL EXPERIMENT STATION

SOIL LEGEND

SYMBOL	NAME
1	Abra-Barx complex
2	Barx fine sandy loam
3	Begay Variant fine sandy loam, 3 to 15 percent slopes
4	Begay-Sazi complex
5	Begay-Sazi-Rizno complex
6	Begay-Rizno complex
7	Blueflat complex
8	Blueflat-Neiber complex
9	Bookcliff-Shalako complex
10	Chipeta silty clay loam, 10 to 25 percent slopes
11	Chipeta complex
12	Chipeta-Badland complex
13	Dast Family, 50 to 80 percent slopes
14	Dune land-Aneth Family complex
15	Factory-Pastern fine sandy loams
16	Firth-Plite Families association
17	Flatnose sandy loam, 1 to 8 percent slopes
18	Hanksville Family-Badland complex
19	Hanksville Family-Shalet complex
20	Hostage-Barx complex
21	Hostage-Chipeta complex
22	Hub Family, 50 to 80 percent slopes
23	Killpack silt loam, 1 to 10 percent slopes
24	Killpack-Chipeta complex
25	Killpack-Blueflat complex
26	Leeko fine sandy loam
27	Lockerby-Shalako complex
28	Mack loam, 2 to 6 percent slopes
29	Mack-Sagers complex
30	Mesa fine sandy loam, 2 to 6 percent slopes
31	Mesa-Chipeta-Thedalund Family complex
32	Mesa-Trook complex
33	Mido loamy fine sand, 2 to 20 percent slopes
34	Mido-Sazi complex
35	Moenkopie-Rock outcrop complex
36	Moenkopie-Shalako-Sandoval complex
37	Moepitz Variant very stony sandy loam, 2 to 10 percent slopes
38	Muff Family-Badland complex
39	Myton Family-Rock outcrop complex
40	Nakai fine sandy loam, 3 to 10 percent slopes
41	Nakai-Moenkopie complex
42	Nakai-Redlands complex
43	Nakai-Sheppard complex
44	Pennell sandy loam, 3 to 15 percent slopes
45	Razorba Family, 50 to 80 percent slopes
46	Redbank Family
47	Redbank-Flatnose Families association
48	Redbank-Flatnose, cool Families association
49	Reva-Falcon Families-Rock outcrop complex
50	Riverwash
51	Rizno-Begay complex
52	Rizno-Rock outcrop complex
53	Rock outcrop
54	Rock outcrop-Arches-Mido complex
55	Rock outcrop-Moenkopie association
56	Sagers silt loam
57	Sandoval-Strych complex
58	Sandoval-Killpack complex
59	Sandoval-Thedalund Family complex
60	Sazi fine sandy loam, 3 to 8 percent slopes
61	Sazi-Shalako-Mido complex
62	Shalako gravelly sandy loam, 3 to 8 percent slopes
63	Shalako sandy loam, 3 to 30 percent slopes
64	Shalet loam, 3 to 10 percent slopes
65	Shalet-Nakai complex
66	Sheppard fine sand, 2 to 10 percent slopes
67	Skylick sandy loam, 8 to 30 percent slopes
68	Slickens
69	Strych fine sandy loam, 1 to 8 percent slopes
70	Sula-Razorba Families complex
71	Thedalund Family, cool
72	Thedalund Family, moist
73	Thedalund Family, stony
74	Thedalund Family-Rock outcrop-Badland association
75	Toddler-Ravola-Glenton Families association
76	Valleycity-Neiber-Rock outcrop complex
77	Walknolls Family, 50 to 80 percent slopes
78	Windwhistle-Begay complex

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES
- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool (Hedley Airstrip; FLOOD POOL LINE)

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS
- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS
- Interstate (21)
- Federal (173)
- State (28)
- County, farm or ranch (1283)

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES
- Without road
- With road
- With railroad

DAMS
- Large (to scale)
- Medium or small (water; w)

PITS
- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES
- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) (Indian Mound)
- Located object (label) (Tower)
- Tank (label) (Gas)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE
- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) (CANAL)
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS
- Perennial (water; w)
- Intermittent (int; i)

MISCELLANEOUS WATER FEATURES
- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS (8, 24)

ESCARPMENTS
- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) (S)

MISCELLANEOUS
- Blowout
- Clay spot
- Gravelly spot
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NUMBER 1
GRAND COUNTY, UTAH CENTRAL PART

2 570 000 FEET

430 000 FEET

T. 15½S. | T. 15 S.

T. 16 S. | T. 15½ S.

R. 22 E. | R. 23 E.

(Joins sheet 9)

2 600 000 FEET

(Joins sheet 2)

390 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 1

2 600 000 FEET

430 000 FEET

T. 15½S. | T. 15 S.

T. 16 S. | T. 15½S.

T. 15½S. | T. 15 S.

T. 16 S. | T. 15½

(Joins sheet 3)

(Joins sheet 1)

(Joins sheet 10)

R. 23 E. | R. 24 E.

2 630 000 FEET

390 000 FEET

WESTWATER GAS FIELD

Drill Hole

Middle Canyon

Hideout Canyon

Horse Canyon

Spring

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 2

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NUMBER 3
GRAND COUNTY, UTAH CENTRAL PART

2 640 000 FEET

4 30 000 FEET

T. 15 S. | T. 15 ½ S.

T. 16 S. | T. 15 ½ S.

(Joins sheet 2)

SURVEY LIMIT OF SOIL

Canyon
Spring
Radio Facility
Middle Fork
OVERLOOK GAS FIELD
Bitter Creek
West Fork
PIPE LINE
Brusher Canyon
East Canyon
Gas Well
Drill Hole
Hideout Canyon
EAST CANYON GAS FIELD
SAN ARROYO GAS FIELD
San Arroyo Camp
Water Tank
SAN ARROYO RIDGE
BOOK CLIFFS

(Joins sheet 4)

(Joins sheet 11)

R. 24 E. | R. 25 E.

2 670 000 FEET

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

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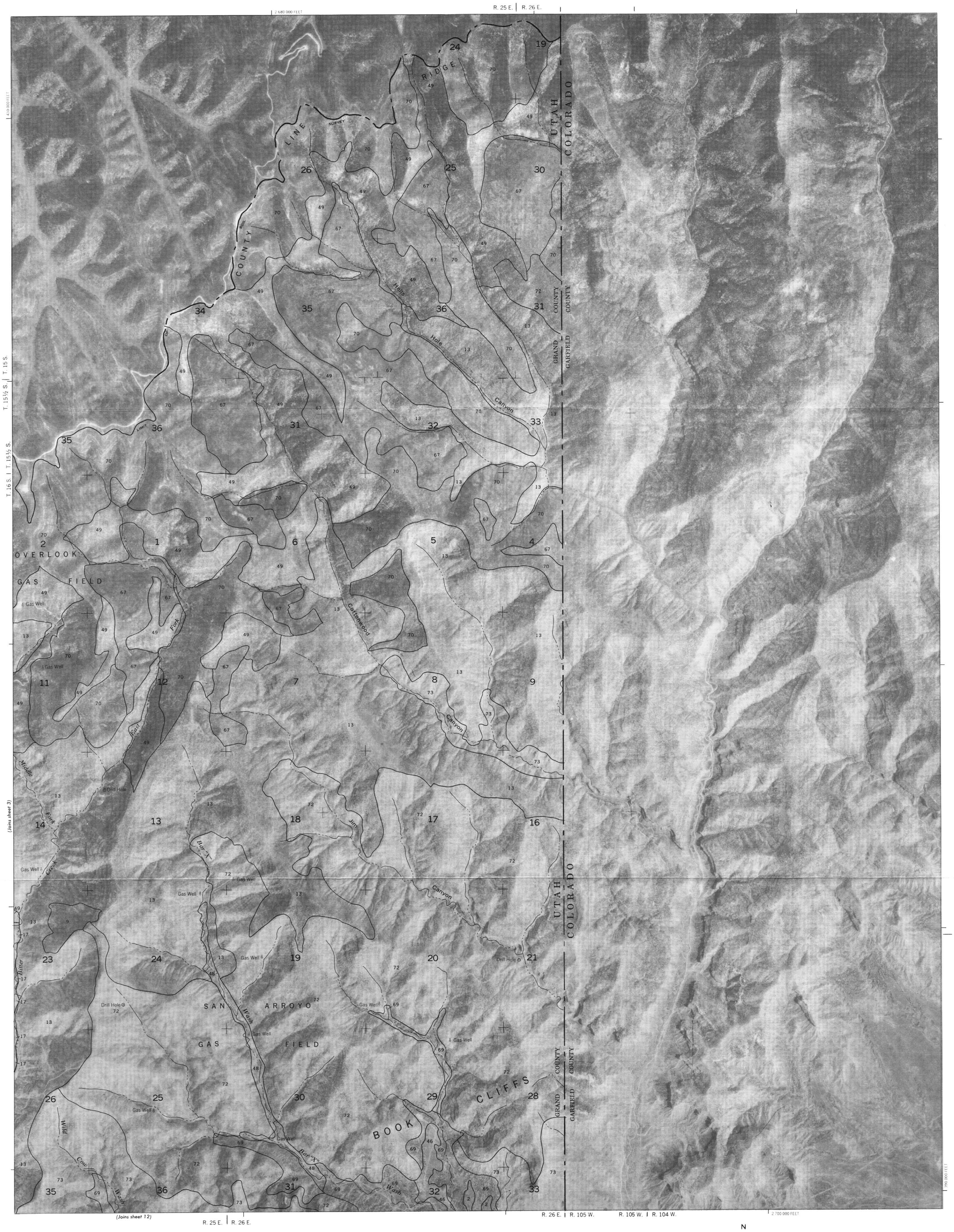
GRAND COUNTY, UTAH CENTRAL PART NO. 3

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NUMBER 4
GRAND COUNTY, UTAH CENTRAL PART



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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 4

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 5

2 430 000 FEET

380 000 FEET

(Joins sheet 5)

T. 18 S. | T. 17 S.

(Joins sheet 7)

INDIAN RESERVATION BOUNDARY
SOIL SURVEY
LIMIT OF

14 13 17 23 24

72 13 17 49 70 22

BOUNDARY SURVEY 49

340 000 FEET

(Joins sheet 14)

R. 17 E. | R. 18 E.

2 460 000 FEET

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

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GRAND COUNTY, UTAH CENTRAL PART NO. 6

2 470 000 FEET

T. 17 S. | T. 16 S.

(Joins sheet 6)

INDIAN LIMIT OF RESERVATION
SOIL SURVEY BOUNDARY
SUNRISE DUGWAY
Canyon
Horse

(Joins sheet 15)

2 490 000 FEET

R. 19 E. | R. 20 E.

140 000 FEET

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

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GRAND COUNTY, UTAH CENTRAL PART NO. 7

2 570 000 FEET

380 000 FEET

SURVEY

SOIL

WEST WATER POINT

Diamond Springs

Canyon

Spring

Light

(Joins sheet 9)

(Joins sheet 17)

2 560 000 FEET

T. 18 S. | T. 17 S.

R. 21 E. | R. 22 E.

36 32 1 12 13

49 70 45 22 17 10 63

5000 4000 3000 2000 1000 0 5000 10000 Feet

1 .5 0 1 2 3 Kilometers

Scale - 1:24000

N

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GRAND COUNTY, UTAH CENTRAL PART NO. 8

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 9

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 10

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 11

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 12

2 390 000 FEET

R. 16 E. | R. 17 E.

(Joins sheet 5)

UINTAH AND OURAY INDIAN RESERVATION

COAL CREEK BENCH

POVERTY BENCH

MESA SULUAR

Coal Creek
Spring
Poverty Canyon
Rattlesnake Canyon
Butler Canyon

GRAND COUNTY
EMERY COUNTY
GRAND COUNTY
EMERY COUNTY

SURVEY LIMIT OF SOIL

T. 19 S. | T. 18 S.

330 000 FEET

(Joins sheet 14)

(Joins sheet 23)

R. 16 E. | R. 17 E.

2 420 000 FEET

300 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24 000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 13

(Joins sheet 6)

R. 17 E. | R. 18 E.

COAL CREEK BENCH

POVERTY BENCH

Poverty Canyon

Flat Canyon

George Canyon

Nose Canyon

Rattlesnake Canyon

Oak Spring Canyon

Winter Camp Canyon

Bobby Canyon

Tusher Canyon

Hand Canyon

Wild Cow Canyon

Left Fork

Right Fork

Naylon Canyon

T. 19 S. | T. 18 S.

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 24)

R. 17 E. | R. 18 E.

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 14

(Joins sheet 7)

2 470 000 FEET

R. 19 E. | R. 20 E.

INDIAN LIMIT RESERVATION OF SOIL BOUNDARY SURVEY

Horse Canyon
George Canyon
Nose Flat
Black Canyon
Trail Canyon
Rattlesnake Canyon
Tusher Canyon
Hand Left Cow Canyon
Wild Hand Canyon
Right Hand Showerbath Canyon
Left Hand Threeforks Canyon
Floy Canyon
Right Hand Threeforks Fork Dry Canyon

Spring
Red Spring
Showerbath Spring

NUTTERS HOLE
THE BASIN
NINE HOLE

SURVEY BOUNDARY

15 22 35 2 16 36

T. 19 S. | T. 18 S.

(Joins sheet 14)

(Joins sheet 16)

2 490 000 FEET

R. 18 E. | R. 19 E.

(Joins sheet 25)

R. 19 E. | R. 20 E.

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 15

2 500 000 FEET

330 000 FEET

(Joins sheet 15)

T. 19 S. | T. 18 S.

T. 19 S. | T. 18 S.

(Joins sheet 17)

2 530 000 FEET

LIMIT OF INDIAN RESERVATION SOIL SURVEY

SURVEY BOUNDARY

Hells Hole Canyon

Left Hand Canyon

Right Hand Canyon

Thompson Canyon

Surveyors Hole

Beaver Wash

Hole Wash

The Pines

Bull Wash

Left Hand Wash

Wash

Wash

70 49 67 45 17 63

5 6 7 8 17 18 19 20 29 30

(Joins sheet 26)

R. 20 E. | R. 21 E.

5000 4000 3000 2000 1000 0 5000 10000 Feet

1 .5 0 1 2 3 Kilometers

Scale - 1:24000

N

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GRAND COUNTY, UTAH CENTRAL PART NO. 16

(Joins sheet 8)

2 540 000 FEET

R. 21 E. | R. 22 E.

4 330 000 FEET

(Joins sheet 16) T. 19 S. | T. 18 S.

T. 19 S. | T. 18 S. (Joins sheet 18)

4 320 000 FEET

(Joins sheet 27)

R. 21 E. | R. 22 E.

2 560 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 17

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 18

(Joins sheet 10)

R. 23 E. | R. 24 E.

2 610 000 FEET

4 340 000 FEET

T. 19 S. | T. 18 S.

(Joins sheet 18)

BOOK CLIFFS GAS FIELD

BOOK CLIFFS

Sulphur Canyon

Antone Canyon

Buck Canyon

Long Canyon

Cottonwood Wash

Sulphur Creek

Antone Wash

Drill Hole

Drill Holes

int

(Joins sheet 20)

T. 19 S. | T. 18 S.

2 630 000 FEET

(Joins sheet 29)

R. 23 E. | R. 24 E.

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 19

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 20

(Joins sheet 12)

2 680 000 FEET

R. 25 E. | R. 26 E.

R. 26 E. | R. 104 W.

340 000 FEET

Winter Camp Draw

San Arroyo

Wash

Bryson Wash

Bitter Creek

Bitter Well (Flowing)

Drill Hole

GRAND CO / MESA CO

UTAH | COLORADO

SURVEY

SOIL

LIMIT

T. 19 S. | T. 18 S.

(Joins sheet 20)

Bitter Creek

May Flat

COUNTY

(Joins sheet 31)

R. 25 E. | R. 26 E.

R. 26 E. | R. 104 W.

2 700 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet

1 .5 0 1 2 3 Kilometers

Scale - 1:24 000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 21

2 360 000 FEET

250 000 FEET

COUNTY
COUNTY
Diversion Dam
EMERY
GRAND
SURVEY
SOIL
LIMIT
COUNTY
COUNTY
EMERY
GRAND
RIVER
GREEN

(Joins sheet 23)

T. 21 S. | T. 20 S.

(Joins sheet 32)

2 390 000 FEET

R. 15 E. | R. 16 E.

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 22

(Joins sheet 13)

R. 16 E. | R. 17 E.

T. 20 S. | T. 19 S.

2 400 000 FEET

GREEN RIVER

BOOK CLIFFS

Tusher Wash

Tusher Canyon

Left Hand Canyon

Right Hand Canyon

Coal Canyon

Stub Canyon

Bench

Spring

GUNNISON VALLEY

T. 21 S. | T. 20 S.

(Joins sheet 22)

(Joins sheet 24)

(Joins sheet 33)

R. 16 E. | R. 17 E.

2 420 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 23

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 24

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NUMBER 25
GRAND COUNTY, UTAH CENTRAL PART

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 25

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 26

(Joins sheet 17)

2 540 000 FEET

R. 21 E. | R. 22 E.

290 000 FEET

T. 20 S. | T. 19 S.

Horse Canyon
Turner Park
Coal Canyon
Left Hand Canyon
Calf Canyon
BOOK CLIFFS
Right Hand Canyon
Bull Canyon
Strychnine Wash
Nash Wash
Pinto Wash
Sagers Wash
Drill Hole
Gas Well
Test Well Oil
Water Well
int

(Joins sheet 26)

(Joins sheet 28)

(Joins sheet 37)

R. 21 E. | R. 22 E.

2 560 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 27

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 28

R. 23 E. | R. 24 E.

(Joins sheet 19)

2 610 000 FEET

T. 20 S. | T. 19 S.

290 000 FEET

(Joins sheet 28)

THE GRASSIES

DANISH WASH GAS AND OIL FIELD

Cottonwood Wash

Drill Hole

Gas Well

CISCO SPRINGS GAS AND OIL FIELD

Danish Wash

DANISH FLAT

AGATE OIL FIELD

Oil Well

CISCO MESA

GRAVEL PILE OIL FIELD

Agate Railroad

70

(Joins sheet 30)

260 000 FEET

T. 21 S. | T. 20 S.

(Joins sheet 39)

R. 23 E. | R. 24 E.

2 630 000 FEET

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GRAND COUNTY, UTAH CENTRAL PART NO. 29

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 30

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

GRAND COUNTY, UTAH CENTRAL PART NO. 31

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 32

(Joins sheet 23)

R. 16 E. | R. 17 E.

2 400 000 FEET

240 000 FEET

RAILROAD

Daly

Browns

Wash

RAILROAD

Solitude

Wash

Solitude

Little

Grand

Wash

2 420 000 FEET

(Joins sheet 32)

T. 22 S. | T. 21 S.

(Joins sheet 34)

T. 22 S. | T. 21 S.

(Joins sheet 42)

R. 16 E. | R. 17 E.

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 33

R. 17 E. | R. 18 E. (Joins sheet 24)

2 430 000 FEET

240 000 FEET

T. 22 S. | T. 21 S. (Joins sheet 33)

T. 21 S. | T. 22 S. (Joins sheet 35)

2 460 000 FEET

R. 17 E. | R. 18 E. (Joins sheet 43)

CLIFFS
BOOK
Canyon
Horse
Seep
THE BASIN
RIDGE
SPRING
Trough Spring
Seep
HORSE MESA
CLIFFS
TROUGH
Seep
Wash
Browns
Test Well
Wash
Green River Gap
Spring
Flow
Spring
BOOK CLIFFS
CHRISTMAS RIDGE
MESA
CLIFFS
HATCH
BOOK
Hatch Ranch
RAILROAD
Solitude
Wash
Spring
RAILROAD
Wash
Corral
Wash
Wash
Crooked
Blue Flat Reservoir
Flow
Grand
Wash
Little
Corral

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 34

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 35

(Joins sheet 26)

2 500 000 FEET

R. 20 E. | R. 21 E.

BOOK CLIFFS

Thompson Canyon

Spring

CEMETERY

RAILROAD

Wash

Stop

Landing

Thompson

Salt

Wash

FLAT

WHIPSAW

Oil Test Well

Oil Test Well

Spring

(Joins sheet 35)

(Joins sheet 37)

T. 22 S. | T. 21 S.

2 510 000 FEET

(Joins sheet 45)

R. 20 E. | R. 21 E.

2 530 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers

Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 36

(Joins sheet 27)

2 540 000 FEET

R. 21 E. | R. 22 E.

240 000 FEET

(Joins sheet 36)

T. 22 S. | T. 21 S.

(Joins sheet 38)

2 560 000 FEET

(Joins sheet 46)

R. 21 E. | R. 22 E.

Pinto Wash
Wash
Sagers
RAILROAD
Bootlegger Wash
Elba
ELBA FLAT
SAGERS FLAT
Oil Test Well
YELLOW CAT ROAD
Salt Wash
Monument Wash
Water Tanks

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 37

(Joins sheet 28)

R. 22 E. | R. 23 E.

2 570 000 FEET

Nash
WINDY
Reservoir
Wash
Cisco
Saleratus
Reservoir
Wash
Reservoir
Test Well
Wash
MESA
Test Well
Test Well
RAILROAD
Saleratus
Wash
Nash
RAILROAD
White House
Oil Well
Oil Well
Pinto
Wash
Pinto
Wash
Wash
Sagers
Wash
Monument
Wash
Cistern
Wash
Sagers
Reservoir
pipe Li.E
Dugout
water
Sagers
Wash
Arroyo
Wash
San

(Joins sheet 37)

T. 22 S. | T. 21 S.

(Joins sheet 39)

T. 22 S. | T. 21 S.

2 600 000 FEET

(Joins sheet 47)

R. 22 E. | R. 23 E

2 570 000 FEET

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 38

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(Joins sheet 29)

2 610 000 FEET

R. 23 E. | R. 24 E.

Cisco
Oil Well
Oil Well (Dry)
CISCO
Dry Oil Well
Oil Well
Oil Well
Landing Strip
Oil Well
Water Well
Oil Well
Dry Oil Well
Reservoir
Reservoir
Reservoir
Reservoir
Reservoir
Reservoir
Reservoir
Reservoir
Reservoir
Dry Oil Well
Seep
Seep
Seep
Hogan Spring
Sagers
Wash
Danish Wash
RAILROAD
PUMPHOUSE
ROAD
DEWEY ROAD
COLORADO RIVER SOIL SURVEY LIMIT

(Joins sheet 38)

(Joins sheet 40)

T. 22 S. | T. 21 S.

T. 21 S. | T. 22 S.

(Joins sheet 48)

R. 23 E. | R. 24 E.

2 640 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 39

(Joins sheet 30)

2 650 000 FEET

R. 24 E. | R. 25 E.

250 000 FEET

Agate Wash
Wash
Cottonwood
Big Hole Canyon Trail
RIVER
SURVEY
SOIL
OF
LIMIT
COLORADO
Hallet Ranch
Reeder Ranch
Gavin Ranch

(Joins sheet 39)

T. 22 S. | T. 21 S.

2 670 000 FEET

R. 24 E. | R. 25 E.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 40

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

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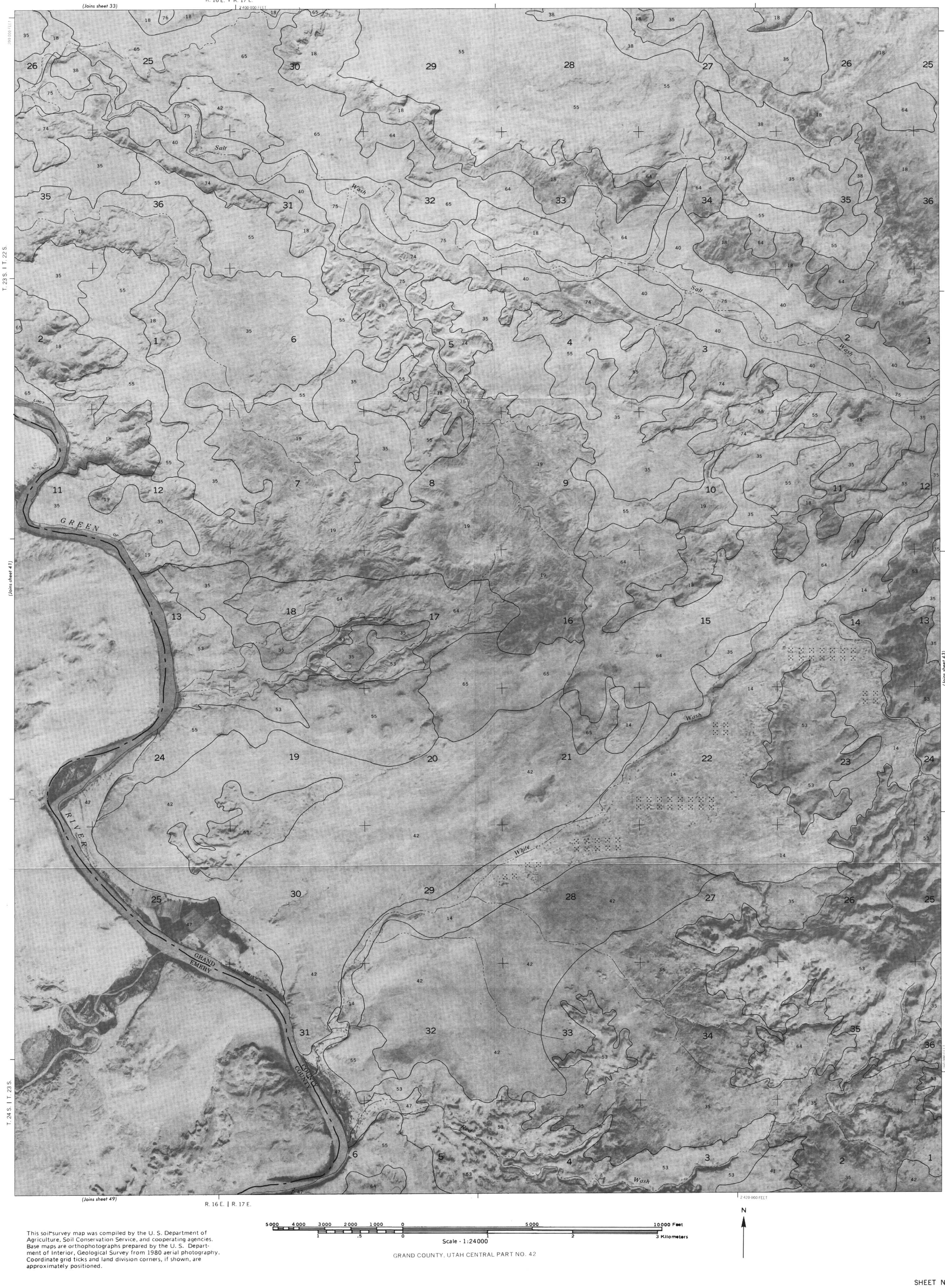
5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 41



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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 42

R. 17 E. | R. 18 E. (Joins sheet 34)

2 430 000 FEET

T. 23 S. | T. 22 S.

(Joins sheet 42)

Wash

Salt

Dee Pass

White Wash

DUMA POINT

Ten Mile Canyon

Thompson Wash

Levi Well

Mile Ten

T. 24 S. | T. 23 S.

R. 17 E. | R. 18 E. (Joins sheet 50)

2 460 000 FEET

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 43

(Joins sheet 35)

2 470 000 FEET

R. 19 E. | R. 20 E.

SALT VALLEY

Valley City (Site)

Wash

Crescent Wash

Thompson

Rock Corral Reservoir

Test Well

Queens Well

Dry Well

Crystal Spring

Ten Mile Wash Reservoir

BLUE HILLS

Klondike Wash

KLONDIKE FLAT

T. 23 S. | T. 22 S.

T. 24 S. | T. 23 S.

(Joins sheet 43)

(Joins sheet 45)

(Joins sheet 51)

2 490 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 44

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 45

N

(Joins sheet 37)

2 540 000 FEET

R. 21 E. | R. 22 E.

200 000 FEET

T. 23 S. | T. 22 S.

LITTLE VALLEY

YELLOW CAT FLAT

THE POISON STRIP

NATIONAL PARK

ARCHES NATIONAL PARK

DEVILS GARDEN

SALT VALLEY

NATIONAL PARK BOUNDARY

Salt Wash
Cat Wash
Yellow Cat Wash
Wash
Dry Oak Spring
Tank
Well (Dry)
Ringtail Mine
Blackstone Mine
Johns Mine
Little Eva Mine
Draw
Agate Wash
Mollie Hogans
Mine
Black Ape Mine
Memphis Hill
Cottonwood Wash
Yellow Bird Mine
PIPE LINE
Lost Spring Canyon
Double "O" Arch
Navajo Arch
Partition Arch
Landscape Arch
Pine Tree Arch
Tunnel Arch
Skyline Arch
Clover Canyon
Lost Spring Canyon
Oil Test Well
Fiery Furnace
Valley Wash

(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 53)

T. 24 S. | T. 23 S.

2 570 000 FEET

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 46

(Joins sheet 38)

R. 22 E. | R. 23 E.

T. 23 S. | T. 22 S.

(Joins sheet 46)

(Joins sheet 48)

(Joins sheet 54)

Dugout Wash
Reservoir
San Arroyo Wash
Agate Wash
Cactus Rat Mine
THE POISON STRIP
Cottonwood Wash
Yellow Cat Reservoir
Cottonwood Wash
THE HIGHLANDS
Caves
Auger Spring
Caves
Caves
Canyon
SQUAW PARK
Jacket Canyon
Seep Draw
Fish Canyon
Yellow Canyon
Tub Canyon
Natural Arch
RIDGE
WINTER CAMP
Wash
Camp Trail
Winter Trail
ARCHES NATIONAL PARK
DOME PLATEAU
DOME PLATEAU

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 47

N

(Joins sheet 39)

2 610 000 FEET

R. 23 E. | R. 24 E.

200 000 FEET

T. 23 S. | T. 22 S.

Gordon Ranch

McGraw Bottom

Seep

Draw

Owl

Yellow Jacket Canyon

Spring

SQUAW PARK

Springs

Buck Spring

Dewey Spring

Cato Ranch

Tar Bucket Canyon

Bull Canyon

Tub Trail Canyon

DOME PLATEAU

RIVER

COLORADO

LIMIT OF SOIL SURVEY

(Joins sheet 47)

(Joins sheet 55)

R. 23 E. | R. 24 E.

2 640 000 FEET

160 000 FEET

T. 24 S. | T. 23 S.

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 48

R. 18 E. | R. 17 E.
2 400 000 FEET

(Joins sheet 42)

1 150 000 FEET

COLORADO RIVER
COUNTY
COUNTY
EMERY
GRAND
LIMIT
POINT
TEN MILE
CANYON
SPRING
Trin-Alcove Bend
Natural Arch
Spring
Canyon
Ten Mile
Bottom
SURVEY
Joe
Hey
Hey Joe Mine
SOIL

(Joins sheet 50)

T. 25 S. | T. 24 S.

R. 16 E. | R. 17 E.
2 420 000 FEET

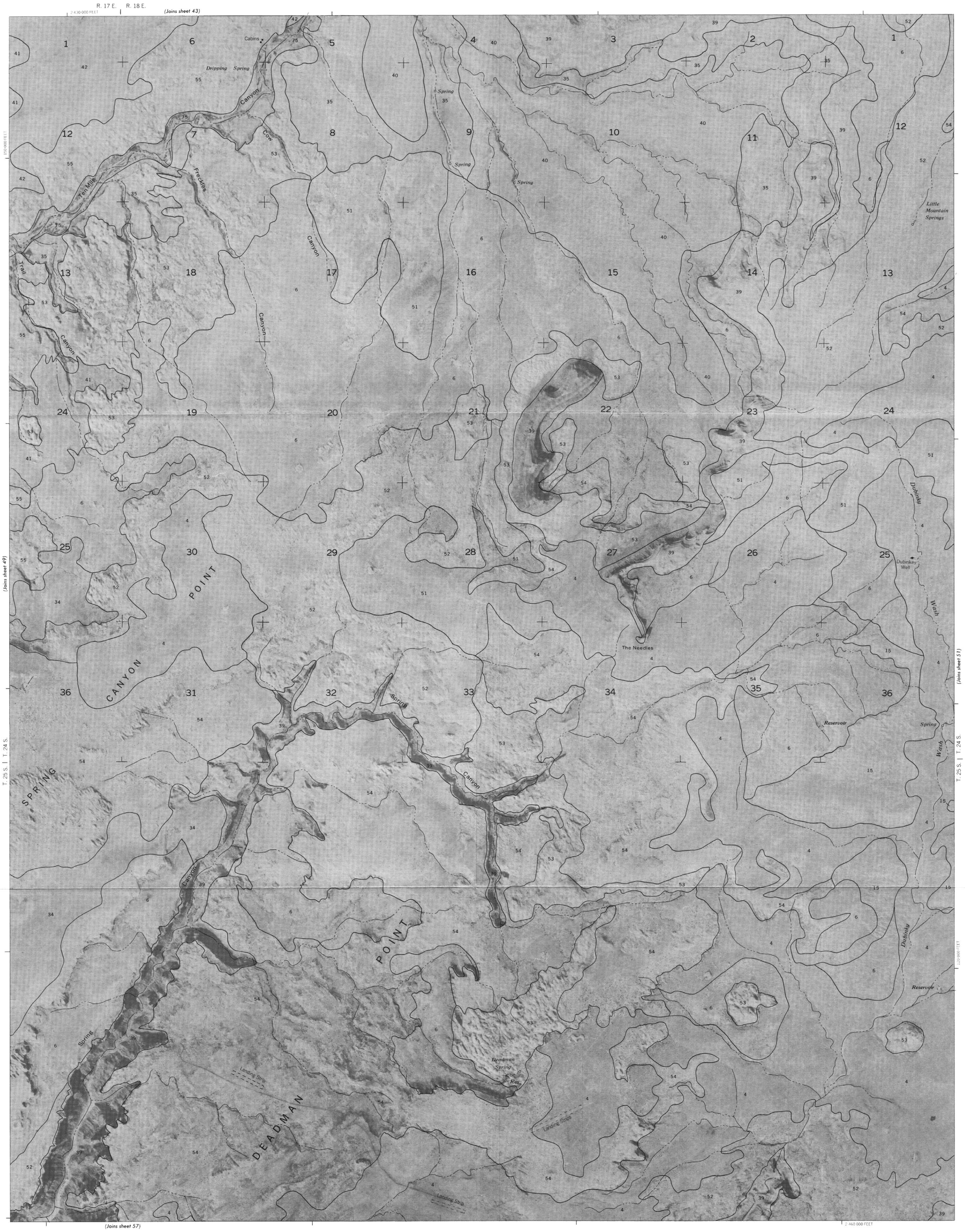
(Joins sheet 56)

N

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 49

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 50

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 51

(Joins sheet 45)
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 59)

R. 20 E. | R. 21 E.

T. 25 S. | T. 24 S.

2 500 000 FEET

1 250 000 FEET

Bartlett Wash
Lower Courthouse Spring
Upper Courthouse Spring
Canyon
Courthouse
Wash
Dalton Well
Cedar Ridge Well
Mill
Wash
CEDAR RIDGE
COURTHOUSE
PASTURE
Seven Mile Canyon
Courthouse
NATIONAL PARK
ARCHES
NATIONAL
PARK
Fork South
ARTH PASTURE
Moab Canyon
Little Canyon

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5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 52

N

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NUMBER 53
GRAND COUNTY, UTAH CENTRAL PART

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 53

SHEET NO. 53 OF 60

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24 000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 54

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 55

(Joins sheet 49)

2 400 000 FEET

R. 16 E. | R. 17 E.

100 000 FEET

SPRING CANYON POINT

Spring Canyon Bottom

GRAND COUNTY
EMERY COUNTY

GREEN RIVER

DEADMAN POINT

HORSETHIEF POINT

Horse thief Bottom

T. 26 S. | T. 25 S.

(Joins sheet 57)

70 000 FEET

2 420 000 FEET

R. 16 E. | R. 17 E.

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers

Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 56

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

N

GRAND COUNTY, UTAH CENTRAL PART NO. 57

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NUMBER 58
GRAND COUNTY, UTAH CENTRAL PART

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 58

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 59

N

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U. S. Department of Interior, Geological Survey from 1980 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

5000 4000 3000 2000 1000 0 5000 10000 Feet
1 .5 0 1 2 3 Kilometers
Scale - 1:24000

GRAND COUNTY, UTAH CENTRAL PART NO. 60

N